VOLUME VI NOVEMBER, 1915 NUMBER 9

THE JOURNAL OF
EDUCATIONAL PSYCHOLOGY

A NEW SCALE OF MENTAL AND PHYSICAL MEASUREMENTS FOR ADOLESCENTS, AND SOME OF ITS USES

HELEN THOMPSON WOOLLEY[1]

Director of the Vocation Bureau, Cincinnati, Ohio

The scale to be reported in this paper is based on the idea frequently expressed that while no one test yields a satisfactory measure of ability, a group of tests probably does give a significant result. The scales now ready for use are for fourteen and fifteen year old native born white children. They are based on 750 fourteen year old children who were dropping out of school to go to work, and on 680 of the same children at fifteen years of age, after being at work for one year. The same tests have been given to corresponding groups of children who are remaining in school, but the scales for them are not yet ready for publication. The same series of tests, with minor modifications from year to year, is being given to the two sets of children at sixteen, seventeen and eighteen years. In order to check up this scale with one of the Binet type, the Yerkes Point Scale is also being given to as many as possible of the eighteen year old group. The accompanying lists will show just what tests are being used at each age, and the measures which enter into the summary scales at fourteen and fifteen.

[1] This paper is the work of the entire laboratory staff of the Vocation Bureau. All members of the staff have tested children, and evaluated results. Charlotte Rust Fischer and the Director have made up the tables of results, and worked out the percentiles. Edward S. Jones, Assistant Director, has estimated all the Pearson co-efficients of correlation.

For the details of methods of giving and evaluating the tests, we must refer to the Monograph on Mental and Physical Measurements of Working Children, No. 77 of the series of supplements to the Psychological Review.

The new scale is constructed as follows: First, each of the mental and physical measurements taken has been stated in terms of ten-percentiles for girls and for boys separately. This table of ten-percentiles is appended to this paper. Each child was then given a rank from one to ten (according to the percentile within which his results fell) on every one of his mental and physical measurements. The percentile ranks for each child were then averaged, first for the set of physical measures, exclusive of height and weight, and second for the set of mental measures. These percentile averages were in turn arranged in tables of ten-percentiles which are appended to this paper. (See tables of averages of percentile ranks and the percentile table of average percentile ranks.)

Any new individual to be tested can, then, be given the same series of tests on which the tables are based, ranked in each test according to the percentile within which his results fall; an

PHYSICAL TESTS

FOR ALL AGES FROM FOURTEEN TO EIGHTEEN YEARS

Vital Capacity
Grip
  Right
  Left

Steadiness
  Right
  Left

Tapping
30″—Right
  Left
One min. Right
  Left

Index of fatigue
  Right
  Left

Card Sorting
  Index

MENTAL TESTS

14 YEARS	15 YEARS	16 YEARS	17 YEARS	18 YEARS
Cancellation Letter-a Index Accuracy	Cancellation Letter-m Index Accuracy	Cancellation Letter-w Index Accuracy	Cancellation Letter-a Index Accuracy	Cancellation Letter-m Index Accuracy
Memory 7 place digits 8 " " 9 " "	Memory 7 place digits 8 " " 9 " "	Memory 7 place digits 8 " " 9 " "	Memory 7 place digits 8 " " 9 " "	Memory 7 place digits 8 " " 9 " "
Substitution Practise pages 1 2 3 memory page 4	Substitution (different key) Practise pages 1 2 3 memory page 4	Substitution (different key) Practise pages 1 2 memory page 3	Substitution (different key) practise pages 1 2 memory page 3	Substitution (different key) practise pages 1 2 memory page 3
Completion of sentences Correctness	Completion of sentences (different blank) Correctness	Completion of sentences (different blank) Correctness	Mutilated Text Time Per cent correct	Mutilated text (new form) Time Per cent correct
No. of ideas Index of ideas Association time	No. of ideas Index of ideas Association time	No. of ideas Index of ideas Association time		
Association by Opposites (easy)	Association by Opposites (medium)	Cause and Effect Per cent perfect Per cent correct	Association by Opposites (hard)	Association by Opposites (easy and hard)
	Healy & Fernald Problem Box Opening Time	Healy & Fernald Problem Box Opening Closing Time Moves	Hayes (Instruction) Box (with diagram) No. trials Errors	Freeman Problem Box Time Moves
Construction puzzles A & B (Healy & Fernald) School series on- ly Time No. of moves		Construction puzzle "Flower Pot" "Egg"	Construction puzzle "Chick" "Ship"	Construction puzzle No. 1 No. 2 "Aussage" No. of correct ideas No. additions Recognition Positive errors Negative errors Hard Directions (Woodward & Wells) Time Per cent correct Additions Free Association (Kent-Rosanoff) Yerkes Point Scale

average of his percentile ranks can be taken, and this average placed on the general scale. This method places each individual in comparison with a large group of supposedly normal people of his own age and sex, somewhere between the poorest individual, who figures on the scale as one, and the best, who figures as 100.

The method of forming the scale is a very rough one. It could be improved by increasing the number, variety, and difficulty of the tests, and also by making divisions finer than tenths of the original series. Some of the methods of estimation could also be bettered. In a test like rote memory, for instance, it will probably prove desirable to take an average for all the series used, instead of a separate average for each length of series. In the substitution test it would perhaps be better to combine the records for all the practise pages into one measure, and use the record for the memory page as a second measure. As we discover which of the tests correlate most closely with general or special abilities, it will be possible to devise a system of weighting the various tests in taking an average. We now know, for instance, that association by opposites and the mutilated text test correlate better with general ability than the cancellation test. Finally, the value of the scale for general uses will be enhanced when the results for school children and those for working children are combined into a single scale. The present scale, it must be remembered, is a first attempt to formulate this kind of a standard, and is very rough in form.

But even in its present rough form, there are proofs that the scale yields information of great significance. In the first place the results for each individual are fairly constant from year to year. Even though the group of individuals on whom the fifteen year scale is based is not exactly identical with that for the fourteen year scale, and the tests also differ slightly the second year, the Pearson co-efficient for the correlation between the fourteen and fifteen year tests of each individual is .66 P. E. .038 for the physical tests, and .71 P. E. .034 for the mental tests. Shifts of more than 15 points on a scale of 100 are rare. In many instances the large shifts can be explained by special circumstances, such as additional school training, or ill health. The exact amount of shifting from year to year will be published when the series is complete.

The second proof of the reliability of the tests is the remark-

able degree of correlation between the school grade of the children and rank in the mental tests. The tables of averages of percentile ranks, give the details for type of school, sex, and school grade, for both mental and physical averages. Graphs 1 to 8 present the relation graphically. The graphs for the averages in physical tests show a small positive correlation with school grade, and those for the mental tests a large positive correlation, so large that the graphs for fifth and eighth grade children cross for only a small portion of their extent.

While the positive correlation with school grade is large it is by no means perfect, and it seemed worth while to make a study of the very exceptional cases. There was one small group of children who had completed only the fifth grade at fourteen years, who ranked higher in the tests than another small group who had completed the eighth grade at the same age. Supposedly the tests measure native ability rather than the exact amount of training a child has had, though it is of course impossible to make a sharp separation of these two factors. On this assumption we reasoned that the fourteen year old children whose tests showed good native ability, but who nevertheless had completed only the fifth grade, must have had unfortunate social circumstances which caused retardation in school, in spite of their superior endowment; while the group whose tests showed poor native ability, but who had nevertheless completed the eighth grade at fourteen years, must have had favorable social surroundings which assisted them through school in spite of inferior endowment. In order to test this hypothesis, we looked up in our files the records of the physical and educational history, and of the home conditions, of these exceptional children. We found our hypothesis absolutely verified.

The very exceptional groups were not large. There were eleven of the very superior fifth grade children—children who ranked 70 or above either at fourteen, or at fifteen, or both years; and there were seventeen of the very inferior eighth grade children, children who ranked 50 or below either at fourteen or at fifteen or at both ages. Of the well endowed children from the fifth grade, one had been retarded by illness. This child had a good home, and good parents, but she had had in the course of her fourteen years spinal meningitis, smallpox, typhoid fever, scarlet fever, measles, and several minor diseases. She is the

only child in this group who had a good home. There were only two others whose fathers were living. One of them was a saloon keeper, and the other an old clothes dealer. In both instances the family lived in the rear of the shop. The other children in this group belonged to families in which the father was dead or a deserter, and the mother a wage earner outside of the home. These children had themselves worked to earn money out of school hours. The families lived in a few rooms, and had shifted about so much in residence that not one of the eleven had been in one school throughout his school period. All but three of them had been in three or more different schools, and some of them in five and six different schools. The mothers of these children were reported to be uninterested in education, and anxious to have the children go to work.

The group of poorly endowed children who had completed the eighth grade at fourteen years presented a direct contrast in social conditions. There were only four of the seventeen whose fathers were dead. Two of these had lost their fathers less than a year before leaving school, and in the other two cases the record of the date of the father's death had been omitted. This group of children, then, belonged to families in which the father was the wage earner. Not one mother of this group was a wage earner outside of the home. Over half (10) of these families owned their own homes, while none of the families of the fifth grade group did. Over half of them had been in one school from the first grade to the eighth, and only three of them had been in more than two schools. But four of them had done any work outside of school hours, and in those cases it was insignificant in amount. The mothers were reported to be women who were interested in education and determined to keep their children in school at least through the eighth grade. Finally, in response to the question whether the child himself liked school, and would have preferred to stay in school if he could, over half of the well endowed fifth grade children replied in favor of school, while but one of the poorly endowed eighth grade children chose school.

To find the apparent anomalies in the estimates made by the scale so uniformly explicable on social grounds is an important piece of evidence in favor of the reliability of the scale as a measure of native mental ability.

The use of the scale has already yielded some interesting results.

1. We have made on the basis of the scale two group comparisons, one of sex and one of type of school. Since the final scales are made up separately for the two sexes, no direct comparison of sex can be based on them, except with regard to variability. A comparison of the percentile tables for the various tests shows that in most of the mental tests the girls are a little superior at this age. Tests of mechanical ingenuity of any type are a marked exception to this statement. The final scales, which are ten-percentile arrangements of percentile averages, furnish a basis for judging of the variability of the two sexes. If variability is measured by the difference between the five and the ninety-five percentiles, the differences in variability in the two sexes are small, and not entirely consistent. In the physical tests the boys are a trifle more variable at fourteen, and decidedly so at fifteen. In the mental tests, the boys are a little more variable at fourteen, while there is a somewhat greater difference in favor of the girls at fifteen.

There is one fact with regard to variability, however, which holds for all the series. The girls show a wider variation below the median than above it. That is to say, while the difference between the sexes in the total range of variation is slight and not always in the same direction, it nevertheless is true in every series that the girls show a greater number of very exceptionally poor individuals, and a smaller number of very exceptionally good individuals as compared with their own median, than the boys.

In comparing public and parochial school children, the original tables of results showed that in every test except rote memory the public school children were somewhat superior. The tables of percentile averages add one interesting fact, which is that a large proportion of children at both extremes come from parochial schools. Both the exceedingly stupid, and the exceedingly brilliant children are more numerous in the parochial than in the public school group. The predominance of parochial school children at the lower end of the series suggests that the parochial school is not as strict as the public school in weeding out defectives, or in refusing promotion from grade to grade on the ground of poor work. The predominance of parochial school children at

the upper end of the series is explained by the fact that a far larger proportion of the parochial school children drop out of school to go to work at fourteen years of age than in the case of the public school, with the result that our parochial school group contains more of the superior members of the school than does the public school group.

The percentile averages showed the same sex difference between the two types of school that we noted in the monograph. While the difference between the two sets of girls is very small, the difference between the two groups of boys is large. Various explanations of this fact have been suggested. The one which seems to us most probable is that the difference can be traced to the type of training given the two sets of boys. The public school boys have more athletics and manual training than the parochial school boys, and these subjects have a stimulating effect on boys. The training offered the two sets of girls does not differ so much. They each have a little sewing and domestic work, and not much else in the realm of the manual. Reports from foremen of machine shops, given me by Mr. Paul Kreutzpointer, educational secretary of the foundrymen's union, tend to confirm this suggestion in stating that parochial school boys are not as apt in shop work as public school boys.

Two other suggestions have been made, one that there is a sex difference in type of mind of such a nature that girls' minds respond naturally to the kind of training offered in parochial schools, while boys' minds do not respond, and are injured by it. The third suggestion is that the parochial schools take more pain in the training of girls, and give them more supervision than boys.

2. The scale has given us a new method of measuring the higher grades of mental defect. The children on whom the scale was based were all children who were at least sufficiently normal to stay in the regular schools up to fourteen years of age, and to complete at least the fifth grade. Nevertheless it is certain that some of them are high grade defectives, and a few of them rather low grade. In our series of tests at eighteen years, we are giving the Yerkes Point Scale to as many as possible of the working group. At the present writing (June 1915) we have fifty Yerkes records in addition to our five annual tests. Only the fourteen and fifteen year tests of these children are available in the form of percentile averages. Before trying the Yerkes

scale we had supposed that most of our young people would fall within the limits for normal adults, that is 75–100, while a few of our poorest ones would fall below. The fifty cases at hand form an unselected group in which there are a few more individuals above than below our median. To our surprise we found that 13 of them, or 26%, fell below 75, while 28, or 56%, fell below 85. The distribution of this first fifty cases is as follows:

Below 60 (i. e., 58)—1 case	71–75.....3 cases	86–90 .....12 cases
61–65.....4 cases	76–80.....10 cases	91–95 ..... 8 cases
66–70.....5 cases	81–85.....5 cases	96–100..... 2 cases

On the Yerkes basis, then, one fourth of our eighteen year old working children belong in the class of mental defectives, while a second fourth is made up of borderline cases.

The correlation of the Yerkes records with our own is not as close as we should have expected to find it. There is of course a decided positive correlation, though a few striking discrepancies occur. There were two individuals who ranked below the median in our tests but were above 85 on the Yerkes scale. One of these is a boy whom we already knew to be an exceptional case. His low rank in our tests was due entirely to his abnormal slowness. He has a remarkable degree of persistence which ultimately brings him success, but in our tests he failed in all the tests with time limits, though he insisted on keeping on until eventually he succeeded in the task. His slowness penalized all his records. It was evident in his association reactions also. The other case is that of a boy who was not far below our median. His tests have been improving decidedly from year to year, though he is certainly not of a superior type. Both of these boys had unusually good homes and English speaking parents.

There were three cases of children who ranked below 75 on the Yerkes scale, but were somewhat above the median on our scale. These were all children with foreign born parents. These results suggest that mere facility with the English language is a much larger factor in the Yerkes tests than in ours.

We have had one other method of comparing results obtained with our scale with those of the usual standards for mental deficiency. We tested by our system a number of the highest grade defectives from our school for defectives. The highest grade pupil the school ever had, who when we saw her at fifteen years tested 79 on the Yerkes scale, ranked 24% on our scale.

That is, there were 24% of our working girls of her age who tested lower than she. The next best pupil ranked just below twelve on the Binet scale, and was 18% on our scale. Most of the defectives, not the most hopeless ones, but those who were to some extent teachable, fell in the lowest five per cent of our scale.

These two sets of results, obtained from different points of view, agree in suggesting that from twenty to twenty-five per cent. of our series of working children would on our present standards be ranked as defectives. The lowest five or ten per cent. would be considered rather low grade morons, and the rest high grade morons. We can see no reason for regarding our eighteen year old working children as exceptional. Since they are all native born whites, most of them with English speaking parents, they probably stand higher in the tests than foreign born laboring people. If these preliminary findings are confirmed, it means that one fourth of our laboring population would on the present standards of measurement be classed as defectives, and if the Binet scale were used instead of the Yerkes, the proportion would be still larger, since the tendency is for Yerkes ratings of adolescents and adults to be higher than the Binet ratings.

The question to be faced now is whether these facts constitute a criticism of our working population, or of our standards for mental deficiency.

None of the children in our series is necessarily destined to industrial failure on the ground of mental defect. The girl who stood lowest of all on both scales (58 on the Yerkes system and 15, or 1% on ours) has worked steadily at simple hand work in a shoe factory for four years. At eighteen she is earning $6.00 a week. A capable girl should be earning nearly twice that in one of the skilled jobs of a shoe factory after that amount of experience. Another girl, only a shade better in the tests, has worked for four years in a candy factory. At eighteen she is earning $3.50 a week, and is still doing the most unskilled work. Candy factories pay much less than shoe factories, but this girl also should be getting nearly twice her present wage, after four years of steady work. Both these girls have good homes, and are carefully guarded. If they were thrown entirely on their own resources, they probably could not take care of themselves,

but so long as they are socially protected, they can contribute their quota to the family income. The boy who stood lowest has also worked steadily for four years, and is doing fairly well. Another of the lowest grade boys has been for four years with the same department store, and has risen from inside messenger at $3.00 a week to driver of a delivery auto at $13.00 a week.

Taken as a group, the inferior children shift about from job to job more than the superior ones, and have longer periods of unemployment. A glance over the list of jobs they hold show that they are of a lower type than those of the superior children. However, differences in mental ability and in amount of education are comparatively small factors in earning capacity during the first few years. There is no relationship between the school grade completed, and the average weekly wage during the first two years. Groups selected on the basis of rank in the tests show more of a difference in weekly wage. The median wage for the group of boys who failed worst in the tests is $3.75 at fourteen years and $4.75 at fifteen years, while for the group of boys who did best in the tests, the median wage is $4.10 at fourteen years and $5.62 at fifteen years. In measuring industrial fitness, then, rank in the tests is a more significant factor than school grade. The wage statistics for the girls apparently contradict this generalization. The median wage for the girls who stood lowest in the tests is $3.40 at fourteen years, and $4.87 at fifteen years, while for those who stood highest, the median wage is only $2.85 at fourteen years, and $4.43 at fifteen years. The contradiction is more apparent than real, however. It is explained by the aristocracy of the department store job. Department store jobs are the poorest paid in the city, and shoe factory jobs best paid, but the department store has its choice of the young workers. Nearly half of our girls who stood highest in the tests were working in department stores for wages varying from $2.00 to $2.50 the first year, and from $3.00 to $3.50 the second. None of the inferior group were able to hold jobs in department stores, though several of them had tried. A large proportion of the inferior group were in the shoe factories at much higher wages. Three of them at fifteen were earning $7.00, $8.50, and $9.00, while the highest wage in the superior group was $6.00. There is no social factor in boys' occupations which corresponds to the lure of the department store for girls.

The exact facts about the relation between grade of intelligence as shown by the tests, and industrial careers, will be published later. Meanwhile we know enough about it to draw a few conclusions with regard to educational policy. It is quite certain that the poorest groups, those who test below standard on both systems, are children who could not profit by much academic instruction. We believe that very few of them could finish creditably, if at all, the work represented by our present eight grades. It is also quite certain that these children could be picked out by experimental methods several years, at least, before time for them to drop out of school. It seems the plain duty of the school to take these children out of the regular classes and give them industrial training for the type of work within their grasp.

In order to safeguard both society, and the most hopeless of these children, we need legislation to provide that as soon as any of the defectives become either delinquent or dependent, they shall be permanently segregated in institutions of an industrial type. Such institutions could be made almost or quite self-supporting.

3. The relation between manual ability and mental ability as shown by the tests offers some interesting suggestions. There is a positive correlation between rank in mental tests and rank in physical tests, but it is small. The Pearson co-efficient is .21 P. E. .064 at fourteen and .33 P. E. .060 at 15 years.

There must, then, be a certain group of children who stand high in the mental tests, and low in the physical and vice-versa, though there is a general tendency for the two to correspond. We can roughly distinguish five groups, poor in both respects, medium in both respects, good in both respects, very good in manual, and poor in mental ability, and very good in mental but poor in manual ability. If these relationships remain fairly constant for the individual, as our results indicate that they do, they furnish one basis for sorting children with reference to the type of training which should be given them.

As a democratic nation, it is our belief that children should be trained for the highest type of pursuit in which they have a fair chance of success. There are of course, many factors involved in success in life. It is by no means certain, for instance, that a child who has the necessary qualifications of mind and hand will

therefore succeed in such professions as medicine, or engineering. The point is, however, that without these basal qualifications he will certainly not succeed, and it is a waste of educational effort to try to make him.

Consider, now, our five rough groups. The individuals who stand consistently low in both respects seems destined for simple manual labor, or low grade industrial positions, provided they have the necessary physical strength. Those who are very lacking in mere strength as well, have slim prospects of being able to earn a living in the modern world. The group whose mental endowment is rather poor, or medium, but whose manual ability is good should be prepared for the skilled trades. Those who have a medium endowment of both kinds should be guided toward the great mass of secondary positions in business and industry. Those whose mental development is exceptionally good, but who are lacking in manual skill should be directed toward such professions as law, the ministry, literary pursuits, the non-experimental academic branches, the higher positions in business and finance, and some types of social work. Those who are gifted with exceptional ability in both directions, manual and mental, should be guided toward such professions as medicine, architecture, engineering, the experimental sciences, the arts, and certain types of social work.

If such a sorting into large groups could be made early, it would be possible to make modifications of our public school curriculum to meet their various needs. In the grammar school the important point would be to pick out early the children whose endowment is so inferior that they cannot profit by a high school course, and give them the kind of training which would best fit them for the industrial work within their grasp. Within the high school the task would be to separate those of medium mental endowment from the exceptionally good ones. The first class should have within the high school preparation for the very skilled trades, including domestic science and nursing, or for clerical or business positions, according to the strength of their tendency toward manual occupations. The second group should have college preparatory work with the stress on experimental science for those with a manual tendency, and on the humanities for the others.

Provided such a system were kept sufficiently flexible so that children whose diagnosis was uncertain, or those who developed unexpectedly could be shifted from one course to another, it would not be open to the criticism that an early sorting of the children into classes is undemocratic and fosters class distinctions. A sorting based upon native endowment, if it proves feasible, is fair to all. To make it effective, it should be supplemented by a system of scholarships for exceptionally gifted children of limited means.

Such a general classification makes no pretense of being able to single out ability in the higher arts. Supposedly the artist is to be sought in the group of individuals who are exceptionally well developed both manually and mentally, though we have as yet no experimental data on the relation between artistic genius and general intelligence. In our own series of children we have one young boy who is very much retarded in school, and very poor in the tests, who nevertheless has a degree of skill in painting which is at least commercially valuable. At fifteen he won a prize of $200 for one of his pictures. To what heights he can rise remains to be seen. Doubtless special tests, such as Mr. Seashore's tests of ability in singing, could be devised for other fields of art.

4. We have already referred to the fact that native endowment, manual and mental, is but one of the determining factors in a career, though it is a very important one. The importance of general appearance, manner, style of dress, and such qualities as persistence, ambition, and social ease, is frequently impressed on us. In our fifth year series of tests we are trying to make a rough record of such facts about each individual. Meanwhile a few instances will illustrate the point.

We were particularly interested in the two girls who stood highest on our list for the first two years. They were both parochial school girls. The first one belonged in a family with a drunken father, a drunken step-mother, and some little half brothers and sisters. Her own mother had been a fine woman, and the girl was pretty, well dressed, and attractive. At seventeen she was working in a cigar factory for $7 a week, all of which she gave her good for nothing father for the support of the family. Through our recommendation the Schmidlapp Bureau offered her a scholarship for a course of training to fit her for

more congenial and suitable work, but, though she hated the cigar factory and her associates in it, she refused the scholarship. The Bureau felt that it was useless for her to try to go on with an education while living at home; her father was of course unwilling to have her leave home; and she had not the necessary ambition or independence to break away and force her father to shoulder his own responsibilities. Under those conditions we could do nothing for her.

The second girl on the list was perfectly content with the eight grades of a parochial school. She had looked into some high school books, and did not think them interesting, nor could she see that more of an education was essential for any calling which she wished to follow. She would not even consider a scholarship.

Meanwhile two girls from the public schools who stood lower in the tests, one of them much lower, started their careers as wage earners with a fixed ambition to have a high school education, and become teachers. Both of them have attended night high school steadily, and are to have scholarships from the Schmidlapp Bureau for higher courses of training as soon as they are graduated. The possession of ambition and of ideals will carry these two girls far beyond the two better endowed ones, whose outlook is different.

Not long ago two eighteen year old boys came to the office at the same time for fifth year tests. They were boys who both fell below 70 on the Yerkes scale. In our series they were both in the lowest ten-percentile. On both systems, then, they ranked as feeble-minded. One of them had the vacant smile which in itself was almost enough to brand him as lacking. He had left several places of employment because as he said, the boys picked on him and teased him. He was collarless and far from neat, though not dirty. His job was simple hand work in a factory, for which he received $6 a week. The other boy might easily have been mistaken for a University student. His collar and tie were faultless, his suit neat, and he was reserved and self-respecting in manner. This boy had a job in routine machine work in a factory at which he was earning $15 a week. While neither of these boys had the slightest prospect of succeeding at any calling higher than unskilled labor, within that limit

there was a vast difference in the outlook. One of them will doubtless be able to do routine machine operating acceptably, keep his positions, and earn steady wages between $15 and $20 a week. The other will probably always be a hanger-on, tolerated here and there at simple, poorly paid jobs; but it is very doubtful if he can ever earn a steady, living wage.

When our records are complete, we hope that we may be able to make some sort of a formulation as to how large a factor manner, appearance, in short, personality, is as compared with mental and physical endowment, home conditions, and the effect of industrial experiences which are at present accidentally determined.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Height in Cms.[2]				Weight in Kgs.[3]				Vital Capacity in Ccs[4]			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	131.0	135.0	137.2	142.0	26.1	29.45	29.5	34.9	1100	1325	900	1000
10	142.6	148.5	146.3	149.9	33.2	38.0	36.1	40.6	1804	1824	1493	1803
20	145.3	151.6	149.3	151.5	35.7	40.6	39.1	43.6	1984	2151	1743	1914
30	147.4	154.1	151.6	154.5	37.9	43.0	41.3	46.0	2106	2313	1894	2017
40	149.3	156.3	153.3	156.2	39.3	45.1	43.1	47.5	2206	2439	1983	2097
50	151.3	158.3	155.0	157.5	40.7	47.1	44.9	49.1	2305	2600	2074	2176
60	153.3	159.6	156.6	158.8	42.2	49.0	46.7	50.8	2404	2746	2171	2287
70	155.2	162.3	158.3	160.5	44.3	51.2	48.7	52.9	2539	2882	2273	2415
80	158.2	164.9	160.1	162.7	46.7	53.7	51.1	55 1	2715	3022	2393	2561
90	161.8	168.6	162.8	165.6	50.5	56.6	54.1	57.4	2935	3260	2586	2734
Upper	171.0	178.3	170.0	174.7	66.1	68.45	86.3	95.0	3600	4400	3125	3200

[2] Height—Taken clothed. Boys without coats.
[3] Weight—Measured in shoes. Heal measured and deducted.
[4] Vital Capacity—Wet Spirometer. Best of three trials.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Grip,[5] Right Hand, in Kg.				Grip, Left Hand, in Kg.				Steadiness,[6] Right Hand in Hole and Contacts.			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
									H.–C.	H.–C.	H.–C.	H.–C.
Lower	11.5	15.0	9.0	13.0	12.0	14.0	8.0	11.0	1–1	2–10	2–11	2–8
10	18.6	22.6	16.3	20.3	18.5	21.3	16.4	18.8	2–0	3–10	3–11	4–12
20	20.6	24.6	19.1	22.6	20.2	23.5	18.8	20.7	3–10	3–3	3–6	4–10
30	22.2	26.2	20.5	23.7	21.9	25.2	20.2	21.9	3–7	4–11	3–0	4–8
40	23.7	27.6	21.6	24.8	23.3	26.8	21.3	23.2	3–0	4–9	4–11	4–4
50	24.9	28.9	22.7	25.9	24.6	28.5	22.2	24.5	4–11	4–7	4–8	5–12
60	26.0	30.2	24.7	27.0	25.7	29.9	23.6	25.7	4–9	4–2	4–6	5–9
70	27.3	32.7	25.9	28.1	26.9	32.1	25.0	26.9	4–7	5–11	5–12	5–3
80	28.9	35.7	27.4	29.4	28.7	34.8	26.3	28.2	4–0	5–7	5–8	6–10
90	31.6	39.0	29.6	31.0	30.7	37.6	29.1	29.6	5–7	6–10	6–11	6–2
Upper	45.0	48.0	37.0	35.0	45.0	47.0	37.0	35.0	7–7	7–6	8–10	8–9

[5] Grip—Smedley Dynamometer. Best of three trials.
[6] Steadiness—Steadiness tester. Limit for each hole, 12 contacts in fifteen seconds.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Steadiness, Left Hand Hole and Contacts				Tapping[7] 30" Right Hand				Tapping 30" Left Hand			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
	H.-C.	H.-C.	H.-C.	H.-C.								
Lower	1-6	1-7	1-7	1-4	120	118	96	105	85	110	86	91
10	2-9	2-2	2-6	3-11	144	150	147	151	117	124	117	121
20	2-0	3-11	3-12	3-6	152	161	154	159	125	131	124	130
30	3-11	3-8	3-9	3-0	158	167	160	163	131	137	130	134
40	3-9	3-3	3-6	4-10	164	172	163	168	136	143	135	139
50	3-7	4-12	3-1	4-8	170	177	167	171	140	147	139	143
60	3-3	4-10	4-11	4-6	174	182	171	175	145	152	145	148
70	4-11	4-8	4-9	5-12	179	186	176	178	151	156	150	153
80	4-7	4-3	4-6	5-9	185	192	180	185	157	162	156	158
90	4-5	5-9	5-6	6-11	191	204	188	195	165	168	166	168
Upper	7-10	7-9	7-10	8-12	226	300	225	234	206	212	198	201

[7] Tapping—Tapping Board and Electric Enumerator. Arm resting on the board,—wrist movement.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Tapping one min. Right Hand				Tapping one min. Left Hand				Index of Fatigue[8] Right Hand			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	219	204	216	201	179	203	167	175	37.8	42.7	38.9	35.8
10	273	287	280	285	223	228	222	231	26.4	25.9	25.7	23.3
20	290	303	291	301	235	248	238	246	23.5	22.3	22.0	20.7
30	303	314	301	309	246	260	247	256	20.7	20.2	19.8	18.9
40	312	324	308	317	256	268	255	264	18.6	18.4	18.2	17.4
50	321	334	315	325	266	276	263	272	16.9	16.6	16.5	16.0
60	330	344	323	332	275	285	273	280	15.4	14.9	14.9	14.5
70	339	353	333	339	285	294	281	290	13.7	13.3	13.5	12.8
80	350	364	344	351	296	304	294	300	11.9	11.3	10.5	10.7
90	364	379	357	367	313	318	311	315	8.9	7.9	8.4	7.7
Upper	443	571	430	440	391	402	372	372	neg. in.	neg. in.	neg. in.	neg. in.

[8] Index of Fatigue—Per cent of loss of speed between first and last quarter minute.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits:	Index of Fatigue Left Hand				Card Sorting,[9] Index in Seconds				Cancellation[10] Index			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	50.0	38.2	44.3	40.3	80.6	78.5	83.5	83.3	726.9	354.4	521.5	402.4
10	26.7	26.1	28.1	24.2	63.7	57.2	54.7	51.3	342.0	239.0	304.0	206.5
20	24.1	23.1	23.9	21.5	58.8	53.4	51.4	46.9	286.2	222.6	251.3	184.8
30	22.5	21.0	20.9	19.7	55.0	50.4	48.9	44.2	259.4	208.3	228.1	171.1
40	19.6	19.3	19.3	18.1	52.9	48.3	47.0	42.5	237.9	195.0	210.9	159.3
50	17.8	17.8	17.9	16.5	50.7	46.4	45.0	40.8	220.2	182.6	195.2	150.8
60	16.1	16.3	16.1	14.8	48.4	44.5	43.5	39.1	206.3	171.8	182.3	142.2
70	13.9	13.9	13.9	13.0	45.9	42.6	41.9	37.6	193.5	161.4	170.2	133.9
80	11.2	11.6	11.2	10.6	43.4	40.7	40.3	36.0	179.7	149.8	157.9	125.8
90	7.9	8.3	7.9	6.4	40.9	37.4	37.4	33.6	162.4	136.5	143.7	113.7
Upper	neg. in	neg. in	neg. in	neg. in	29.3	28.4	31.4	28.5	113.8	105.1	111.5	84.1

[9] Card Sorting—Forty-eight cards, four colors. Sorted face up.
[10] Cancellation—Printed page of small letters. Letter a, 14 years; letter m, 15 years.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits.	Cancellation Accuracy in %				Memory[11] in %. 7 Place Digits				Memory, 8 Place Digits			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	19.0	50.0	30.8	52.0	39.3	46.0	35.0	57.0	22.0	9.4	25.0	22.0
10	54.8	77.0	56.4	83.9	64.8	75.3	67.9	77.6	49.5	57.2	50.1	54.8
20	66.7	87.2	65.2	88.5	75.6	85.9	76.7	86.9	59.3	66.6	60.0	67.3
30	74.9	90.2	73.9	91.8	84.4	88.9	85.7	89.9	66.8	71.1	68.9	72.6
40	78.3	92.5	78.1	95.0	88.4	91.7	89.0	93.1	70.9	74.5	72.9	77.6
50	83.3	94.8	81.6	96.3	91.1	94.2	91.8	95.8	74.8	80.8	78.6	83.4
60	87.1	96.3	85.0	97.1	93.1	96.1	93.9	96.8	82.1	86.4	84.4	88.9
70	89.6	97.4	88.5	98.0	95.2	97.2	95.9	97.8	87.7	91.3	90.0	93.4
80	93.7	98.4	92.0	98.9	97.1	98.5	97.5	98.6	92.7	94.2	93.7	95.4
90	97.5	99.5	95.4	99.7	98.8	99.5	99.2	99.7	96.5	98.0	97.2	98.0
Upper	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[11] Memory—Series of 7, 8, and 9 Place Digits. Average of two series of each length. Visual,—Auditory,—Motor Method with Metronome, one a second. No ranks of 10 were given in 7 place memory, because from 30 to 50 per cent of each group had perfect records. Ranks of 8 or 9 were used instead according to the size of the group of perfect records.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Memory, 9 Place Digits				Substitution,[12] Page 1, Index				Substitution, Page 2, Index			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	11.0	17.0	22.0	22.0	400.0	286.6	419.5	307.8	378.0	241.3	298.4	295.1
10	44.4	46.3	43.1	47.2	227.5	205.8	217.1	200.6	184.8	168.6	176.1	168.1
20	51.4	53.6	50.3	56.3	208.1	186.2	192.4	177.0	165.2	151.4	159.0	145.3
30	56.6	59.0	58.7	61.0	195.0	174.6	179.3	166.2	151.4	139.9	149.0	134.3
40	60.6	64.3	63.7	65.5	183.7	165.8	170.9	156.6	139.5	131.8	139.1	126.5
50	66.1	69.5	68.2	71.5	172.7	157.3	162.6	148.6	133.2	123.7	130.4	119.0
60	71.4	73.7	72.5	77.4	161.9	149.6	154.3	140.5	126.9	115.9	121.8	112.9
70	75.8	81.6	78.0	82.8	151.9	141.7	146.1	133.8	120.6	108.4	113.1	106.7
80	83.6	87.2	85.9	87.1	142.0	132.3	136.9	127.1	110.4	100.8	104.4	100.6
90	92.1	93.6	92.5	92.8	129.4	122.4	125.0	120.3	99.8	88.5	92.7	88.6
Upper	100	100	100	100	71.0	82.2	83.3	98.4	68.5	55.0	68.0	67.4

[12]Substitution—Nine geometrical forms to be associated with nine digits. Four pages of fifty forms each. Page 4 from memory.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Substitution, Page 3, Index				Substitution, Page 4, Index				Sentences,[13] No. begun in 2″			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	276.4	355.5	242.9	248.6	1257.6	906.5	60000	19875	0.0	0.0	0.0	0.0
10	165.5	156.9	156.0	150.9	226.0	238.5	217.2	225.3	0.8	0.0	0.6	0.0
20	145.9	138.9	139.9	134.4	162.3	163.2	161.4	153.0	1.7	1.5	1.6	0.9
30	133.6	127.8	129.7	122.9	137.1	131.7	140.5	130.2	2.6	2.9	2.8	1.9
40	124.0	117.9	119.7	115.2	121.0	114.7	125.4	115.1	4.2	4.4	3.7	3.0
50	115.9	110.7	112.7	108.7	111.2	104.9	112.6	103.9	4.9	5.7	4.7	4.9
60	108.7	103.6	105.8	102.3	101.9	96.1	101.0	95.6	5.9	6.9	5.8	6.1
70	101.6	96.0	98.6	95.5	93.6	88.3	92.6	88.5	6.9	8.1	7.1	7.3
80	92.5	88.0	89.4	88.4	85.6	80.5	84.5	81.9	8.3	9.3	8.3	8.6
90	82.8	80.1	80.3	81.3	75.1	69.6	73.5	70.4	10.0	10.7	9.6	10.5
Upper	59.4	54.0	59.8	59.2	53.0	52.6	52.3	50.6	13.0	13.0	13.0	13.0

[13] Sentences—Completion of 13 sentences.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Sentences, No. of Ideas				Sentences, Index of Ideas[15]				Sentences, No. Correct			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14[16]	15	14	15	14	15	14	15	14	15	14	15
Lower	6.0	7.0	7.0	8.0	106.0	99.4	42.0	90.0				
10	12	14	12	14	20.5	20.2	18.0	19.4	8.8	10.3	8.9	9.4
20	13	16	13	17	16.2	15.4	14.9	15.9	9.8	11.4	10.0	11.1
30	14	18	15	19	13.9	12.8	13.2	12.4	10.6	12.1	10.7	12.1
40	15	20	16	21	12.4	11.7	11.9	10.9	11.3	12.6	11.4	12.4
50	17	22	17	23	11.1	10.5	10.7	10.2	11.9	13.0	12.1	12.8
60	18	24	19	25	10.0	9.6	9.7	9.4	12.4	13.2	12.4	13.1
70	20	26	20	26	9.2	8.8	8.8	8.5	12.8	13.4	12.8	13.3
80	23	28	23	28	8.4	7.5	7.9	7.6	13.2	13.6	13.1	13.6
90	25	32	26	32	7.2	6.8	7.0	6.7	13.6	13.8	13.6	13.9
Upper	59.0	59	39	46	4.7	4.3	4.9	4.2				

[16] One complete failure.
[15] Number of seconds per idea expressed.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

	Opposites[14]		Accuracy in %		Puzzle Box[18]	Time in sec.
	Boys		Girls		Boys	Girls
	14	15	14	15	15	15
Lower	15.0	17.0[17]	20.0	7.5	Failure	Failure
10	49.4	56.6	57.8	56.5	720 Failure	720 Failure
20	59.7	64.9	67.7	67.9	634	720 Failure
30	68.8	69.9	72.1	73.2	465	720 Failure
40	73.6	73.9	75.4	76.7	365	712
50	78.4	77.3	79.6	80.0	304	602
60	82.3	80.5	84.2	83.9	261	470
70	85.4	83.9	87.6	87.4	220	386
80	89.4	87.6	90.4	90.4	175	298
90	93.5	92.2	94.1	93.9	126	227
Upper	100	100	100	100	45	95

[14] Opposites—List of twenty words. Harder lists used at fifteen than at fourteen years.
[17] One complete failure.
[18] Puzzle Box—Healy and Fernald Box. Painted black inside. Recorded no. of seconds required to open box. 720 failure.

Averages of Percentile Ranks in Physical Tests. 14 Year Old Working Children.

PUBLIC SCHOOL.

	Boys										Girls									
Grade	V		VI		VII		VIII	IX	VIII and IX		V		VI		VII		VIII	IX	VIII and IX	
Average	No.	%	No.	%	No.	%	No.	No.	%		No.	%	No.	%	No.	%	No.	No.	%	
11-15	0		0		0		0				0		0		0		0			
16-20	0		0		0		0				0		0		0		0			
21-25	1	1.1	1	1.4	0		0				0		0		0		0			
26-30	3	3.2	2	2.7	1	2.2	0				1	2.3	1	1.7	2	4.6	0			
31-35	11	11.8	2	2.7	0		1	1	7.7		2	4.6	2	3.3	2	4.6	1			3.7
36-40	6	6.4	6	8.2	1	2.2	1		3.8		3	7.0	7	11.7	1	2.3	1			3.7
41-45	6	6.4	6	8.2	3	6.5	3		11.5		5	11.6	3	5.0	4	9.3	4	1		18.5
46-50	12	12.9	7	9.6	8	17.4	0				9	20.9	8	13.3	6	13.9	4			14.8
51-55	13	14.0	10	13.7	7	15.2	1		3.8		2	4.6	8	13.3	5	11.6	1	1		7.4
56-60	13	14.0	9	12.3	2	4.3	3		11.5		7	16.3	10	16.7	3	7.0	2			7.4
61-65	9	9.7	11	15.1	8	17.4	4		15.4		4	9.3	7	11.7	6	13.9	3			11.0
66-70	6	6.4	7	9.6	3	6.5	4		15.4		2	4.6	2	3.3	4	9.3	0			
71-75	4	4.3	4	5.5	6	13.0	2		7.7		5	11.6	5	8.3	4	9.3	3	1		14.8
76-80	3	3.2	5	6.8	4	8.7	2	1	11.5		2	4.6	3	5.0	5	11.6	2			7.4
81-85	4	4.3	2	2.7	1	2.2	1		3.8		1	2.3	3	5.0	1	2.3	2			7.4
86-90	2	2.1	1	1.4	2	4.3	2		7.7		0		1	1.7	0		1			3.7
91-95	0		0		0		0				0		0		0		0			
Totals	93		73		46		24	2			43		60		43		24	3		

PAROCHIAL SCHOOL.

11-15	0		0		0		0				1	3.8			0		0			
16-20	1	3.6	0		0		0				0				1	1.8	0			
21-25	0		1	1.7	0		0				0		3	6.7	2	3.6	1			2.8
26-30	2	5.2	1	1.7	1	1.5	1		2.4		0		3	6.7	0		0			
31-35	2	5.2	3	5.0	6	9.2	2		4.9		3	11.5	3	6.7	2	3.6	1			2.8
36-40	4	10.5	4	6.7	2	3.1	4		9.8		1	3.8	3	6.7	4	7.1	1			2.8
41-45	7	18.4	9	15.0	8	12.3	1		2.4		4	15.4	5	11.1	7	12.5	0			
46-50	5	13.2	11	18.3	10	15.4	4		9.8		3	11.5	6	13.3	7	12.5	3	1		11.4
51-55	3	7.9	9	15.0	11	16.9	8		19.5		4	15.4	7	15.5	8	14.3	6	1		20.0
56-60	6	15.8	5	8.3	5	7.7	7		17.0		4	15.4	7	15.5	7	12.5	4			11.4
61-65	4	10.5	7	11.7	7	10.8	2	1	7.3		0	0.0	3	6.7	6	10.7	6			17.1
66-70	2	5.2	5	8.3	8	12.3	4		9.8		3	11.5	2	4.4	8	14.3	4	1		14.3
71-75	2	5.2	4	6.7	4	6.1	1	1	4.9		1	3.8	2	4.4	3	5.3	2			5.7
76-80	0		0		2	3.1	1		2.4		2	7.7	0		1	1.8	2			5.7
81-85	0		1	1.7	0		2		4.9		0		1	2.2	0		2			5.7
86-90	0		0		0		1		2.4		0		0		0		0			
91-95	0		0		1	1.5	0	1	2.4		0		0		0		0			
Totals	38		60		65		38	3			28		45		56		32	3		

Averages of Percentile Ranks in Physical Tests. 15 Year Old Working Children.

PUBLIC SCHOOL.

	Boys									Girls								
Grade	V		VI		VII		VIII	XI	VIII and IX	V		VI		VII		VIII	IX	VIII and IX
Averages	No.	%	No.	%	No.	%	No.	No.	%	No.	%	No.	%	No.	%	No.	No.	%
11-15	0		0		0		0			0						0		
16-20	0		0		0		0			0		1	1.9			0		
21-25	0		0		0		0			0		0				0		
26-30	2	2.5	2	3.2	0		0			1	2.8	0		2	5.6	0		
31-35	8	10.0	4	6.5	4	9.3	0			0		3	5.7	4	11.1	2		9.5
36-40	8	10.0	2	3.2	1	2.3	1		4.2	0		4	7.5	2	5.6	1		4.7
41-45	9	11.2	3	4.8	2	4.6	3		12.5	5	13.9	4	7.5	2	5.6	1		4.7
46-50	6	7.5	11	17.8	5	11.7	1		4.2	10	27.8	6	11.4	2	5.6	0	1	4.7
51-55	12	15.0	8	12.8	6	14.0	4	1	20.8	3	8.4	7		3	8.3	3		14.3
56-60	10	12.5	11	17.8	3	7.0	4		16.7	2	5.5	9		4	11.1	0		
61-65	10	12.5	8	12.8	6	14.0	0			7	19.5	11	20.8	4	11.1	5		23.9
66-70	5	6.2	5	8.3	4	9.3	5		20.8	4	11.1	5	9.4	7	19.5	1		4.7
71-75	5	6.2	3	4.8	5	11.7	2		8.3	2	5.5	2	3.8	3	8.3	2		9.5
76-80	2	2.5	4	6.5	2	4.6	0			2	5.5	1	1.9	2	5.6	2		9.5
81-85	2	2.5	1	1.6	3	7.0	1	1	8.3	0		0		1	2.8	3		14.3
86-90	1	1.3	0		0		0			0		0		0		0		
91-95	0		0		2	4.6	1		4.2	0		0		0		0		
Totals	80		62		43		22	2		36		53		36		20	1	

PAROCHIAL SCHOOL.

11-15	0		1	1.9			0			1	4.2	0		0		0		
16-20	0		1	1.9			0			0		1	2.7	0		0		
21-25	0		0				1		3.0	0		0		2	3.9	0		
26-30	0		1	1.9	1	1.6	0			3	12.5	0		0		0		
31-35	2	5.7	4	7.6	5	8.0	1		3.0	0		6	16.2	1	2.0	2		6.9
36-40	4	11.4	6	11.6	4	6.5	4		12.1	2	8.3	0		4	7.8	1		3.4
41-45	5	14.3	3	5.7	7	11.3	3		9.1	1	4.2	7	18.9	7	13.7	1		3.4
46-50	3	8.6	12	23.1	8	12.9	3		9.1	6	25.0	6	16.2	8	15.7	3	2	17.3
51-55	5	14.3	4	7.6	6	9.7	4		12.1	2	8.3	2	5.4	10	19.6	6		20.7
56-60	7	20.0	4	7.6	13	20.9	4		12.1	5	20.9	3	8.1	2	3.9	6		20.7
61-65	4	11.4	8	15.4	6	9.7	1		3.0	1	4.2	6	16.2	4	7.7	2		6.9
66-70	2	5.7	2	3.8	5	8.0	4		12.1	1	4.2	3	8.1	6	11.9	3	1	13.8
71-75	2	5.7	2	3.8	2	3.2	4		12.1	1	4.2	3	8.1	4	7.7	2		6.9
76-80	1	2.9	2	3.8	4	6.5	2		6.1	0		0		2	3.9	0		
81-85	0		2	3.8	0		2		6.1	0		0		0		0		
86-90	0		0		1	1.6	0			0		0		1	2.0	0		
91-95	0		0		0		0			1	4.2	0		0		0		
Totals	35		52		62		33			24		37		51		29	3	

Averages of Percentile Ranks in Mental Tests. 14 Year Old Working Children.

PUBLIC SCHOOL.

	Boys									Girls								
Grade	V		VI		VII		VIII	IX	VIII and IX	V		VI		VII		VIII	IX	VIII and IX
Average	No.	%	No.	%	No.	%	No.	No.	%	No.	%	No.	%	No.	%	No.	No.	%
11-15	1	1.1	0		0		0			0		0		0		0		
16-20	2	2.1	0		0		0			2	4.6	0		0		0		
21-25	0		1	1.4	0		0			3	7.0	0		0		0		
26-30	5	5.4	0		0		0			1	2.3	3	5.0	1	2.4	0		
31-35	7	7.5	3	4.1	0		2		7.7	1	2.3	5	8.3	1	2.4	0		
36-40	15	16.1	4	5.5	1	2.2	0			8	18.6	3	5.0	4	9.5	0		
41-45	17	18.3	7	9.6	2	4.3	0			5	11.6	9	15.0	4	9.5	0		
46-50	12	12.9	9	12.3	1	2.2	1		3.8	7	16.3	4	6.7	5	11.9	1	1	7.7
51-55	12	12.9	8	11.0	3	6.5	0			6	14.0	7	11.7	7	16.7	3		11.5
56-60	11	11.8	14	19.2	11	23.9	2	1	11.5	6	14.0	13	21.7	4	9.5	3		11.5
61-65	4	4.3	15	20.5	6	13.0	4	1	19.2	1	2.3	10	16.7	5	11.9	2	1	11.5
66-70	3	3.2	3	4.1	7	15.2	4		15.4	1	2.3	1	1.7	4	9.5	3		11.5
71-75	1	1.1	4	5.5	8	17.4	5		19.2	1	2.3	2	3.3	4	9.5	4		15.4
76-80	3	3.2	4	5.5	5	10.9	0			0		3	5.0	2	4.8	5		19.2
81-85	0		1	1.4	2	4.3	4		15.4	1	2.3	0		1	2.4	1		3.8
86-90	0		0		0		2		7.7	0		0		0		2		7.7
91-95	0				0		0			0		0		0		0		
Totals	93		73		46		24	2		43		60		42		24	2	

PAROCHIAL SCHOOL.

11-15	0		0		0		0			0		1	2.2	0		0		
16-20	1	2.6	0		0		0			1	3.8	1	2.2	1	1.8	0		
21-25	3	7.9	1	1.7	0		0			1	3.8	1	2.2	1	1.8	0		
26-30	3	7.9	5	8.3	2	3.1	0			1	3.8	3	6.7	0		0		
31-35	7	18.4	2	3.3	2	3.1	2		4.9	4	15.4	3	6.7	1	1.8	0		
36-40	8	21.0	7	11.7	3	4.6	0			5	19.2	6	13.3	1	1.8	0		
41-45	5	13.2	9	15.0	5	7.7	1		2.4	4	15.4	4	8.9	4	7.1	2		5.7
46-50	1	2.6	6	10.0	3	4.6	2		4.9	2	7.7	4	8.9	1	1.8	1		2.9
51-55	3	7.9	6	10.0	17	26.1	5		12.2	5	19.2	6	13.3	9	16.1	1		2.9
56-60	5	13.2	8	13.3	7	10.8	5		12.2	0		4	8.9	9	16.1	7		20.0
61-65	0	0	5	8.3	6	9.2	7	1	19.5	1	3.8	6	13.3	6	10.7	4		11.4
66-70	2	5.3	7	11.7	5	7.7	3		7.3	2	7.7	0		7	12.5	6	1	20.0
71-75	0		1	1.7	3	4.6	5	1	14.6	0		2	4.4	8	14.3	5	2	20.0
76-80	0		1	1.7	1	1.5	2	1	7.3	0		1	2.2	5	8.9	5		14.3
81-85	0		1	1.7	7	10.8	3		7.3	0		3	6.7	2	3.6	0		
86-90	0		1	1.7	3	4.6	3		7.3	0		0		1	1.8	1		2.9
91-95	0		0		1	1.5	0			0		0		0		0		
Totals	38		60		65		38	3		26		45		56		32	3	

Averages of Percentile Ranks in Mental Tests. 15 Year Old Working Children.

PUBLIC SCHOOLS.

	Boys										Girls									
Grade	V		VI		VII		VIII	IX	VIII and IX		V		VI		VII		VIII	IX	VIII and IX	
Averages	No.	%	No.	%	No.	%	No.	No.	%		No.	%	No.	%	No.	%	No.	No.	%	
11-15	0		0		0		0				0		0		0		0			
16-20	0		0		0		0				0		0		0		0			
21-25	0		0		0		0				1	2.8	1	1.9	0		0			
26-30	3	3.7	1	1.6	0		0				1	2.8	1	1.9	0		0			
31-35	10	12.5	3	4.8	0		0				8	22.2	3	5.7	1	2.8	0			
36-40	12	15.0	5	8.1	1	2.3	1		4.2		2	5.5	3	5.7	3	8.3	0			
41-45	11	13.7	8	12.9	2	4.6	0				3	8.3	8	15.1	2	5.5	0			
46-50	12	15.0	5	8.1	1	2.3	0				4	11.1	6	11.3	5	13.9	0			
51-55	6	7.5	8	12.9	7	16.3	4		16.7		6	16.7	9	17.0	6	16.7	0			
56-60	15	18.7	11	17.7	12	27.9	5		20.8		3	8.3	7	13.2	4	11.1	3		14.3	
61-65	3	3.7	8	12.9	8	18.6	2		8.3		3	8.3	8	15.1	0		4		19.0	
66-70	3	3.7	4	6.4	6	13.9	2	1	12.5		3	8.3	6	11.3	10	27.8	4	1	23.8	
71-75	3	3.7	5	8.1	5	11.6	4		16.7		1	2.8	0		5	13.9	4		19.0	
76-80	2	2.5	4	6.4	0		2	1	12.5		1	2.8	1	1.9	0		5		23.8	
81-85	0		0		0		1		4.2		0		0		0		0			
86-90	0		0		1	2.3	1		4.2		0		0		0		0			
91-95	0		0		0						0		0		0		0			
Totals	80		62		43		22	2			36		53		36		20	1		

PAROCHIAL SCHOOLS.

11-15	0		0		0		0				0		1	2.7	0		0			
16-20	2	5.7	0		0		0				0		1	2.7	0		0			
21-25	1	2.8	0		0		0				1	4.2	0		0		0			
26-30	0		0		0		0				1	4.2	1	2.7	2	3.9	1		3.6	
31-35	4	11.4	6	11.3	2	3.2	1		3.1		3	12.5	6	16.2	2	3.9	0			
36-40	9	25.7	4	7.5	5	8.1	1		3.1		1	4.2	4	10.8	2	3.9	2		7.1	
41-45	7	20.0	5	9.4	5	8.1	2		6.3		6	25.0	3	8.1	2	3.9	1		3.6	
46-50	3	8.6	10	18.9	7	11.3	1		3.1		2	8.3	4	10.8	6	11.7	0			
51-55	3	8.6	10	18.9	11	17.7	5		15.6		1	4.2	7	18.9	11	21.6	4		14.3	
56-60	2	5.7	4	7.5	12	19.3	8		25.0		2	8.3	5	13.5	7	13.7	0			
61-65	2	5.7	8	15.1	8	12.9	2		6.3		5	20.8	1	2.7	5	9.8	6		21.4	
66-70	2	5.7	5	9.4	2	3.2	3		9.4		1	4.2	2	5.4	3	5.9	4	1	17.9	
71-75	0		1	1.9	3	4.8	6		18.7		1	4.2	2	5.4	6	11.7	4		14.3	
76-80	0		0		5	8.1	1		3.1		0		0		1	2.0	2	1	10.7	
81-85	0		0		2	3.2	1		3.1		0		0		4	7.8	1	1	7.1	
86-90	0		0		0		1		3.1		0		0		0		0			
91-95	0		0		0		0				0		0		0		0			
Totals	35		53		62		32				24		37		51		25	3		

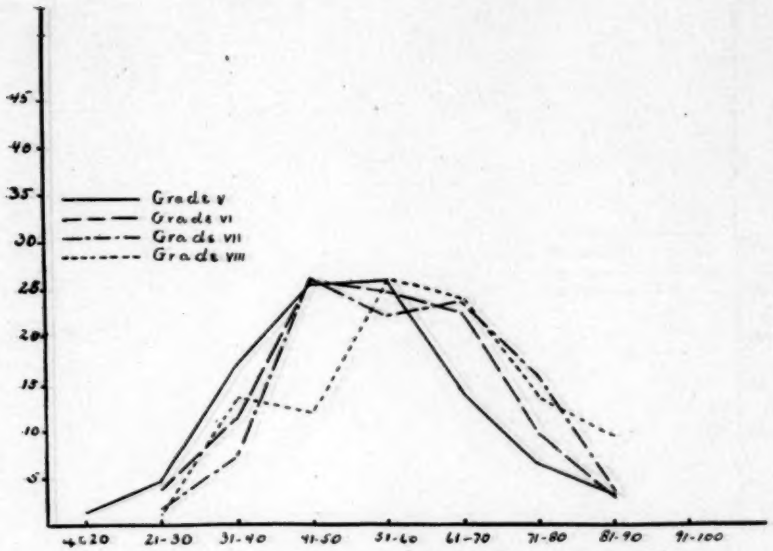
*One omitted. Tests incomplete.

Distribution of Average Percentile Ranks.

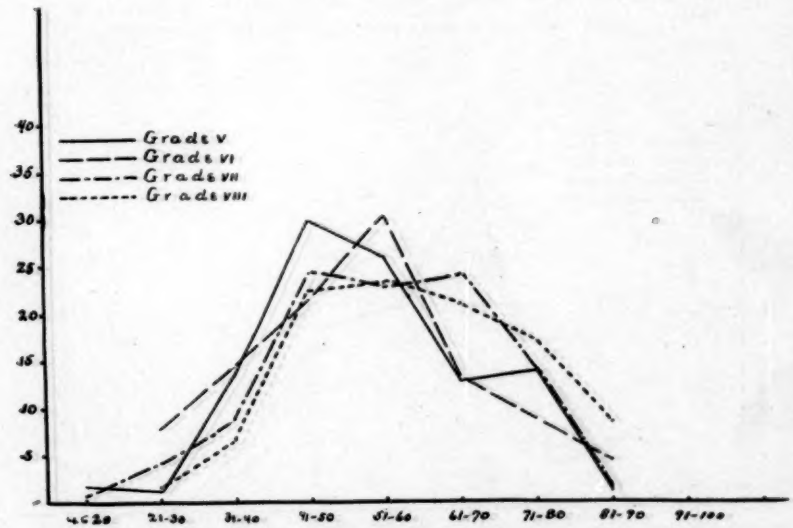
	Physical Tests				Mental Tests			
	Boys		Girls		Boys		Girls	
Age	14	15	14	15	14	15	14	15
11–15	0	1	1	1	1	0	1	1
16–20	1	1	1	2	3	2	5	1
21–25	3	1	6	2	5	1	6	3
26–30	11	6	7	6	15	4	9	7
31–35	28	28	16	18	25	26	15	23
36–40	28	30	21	14	38	38	27	17
41–45	43	35	33	28	46	40	32	25
46–50	57	49	47	44	35	39	26	27
51–55	62	50	43	36	54	54	44	44
56–60	50	56	44	31	64	69	46	31
61–65	53	43	35	40	49	41	36	32
66–70	39	32	26	31	34	28	25	35
71–75	28	25	26	19	28	27	28	23
76–80	18	17	17	9	17	15	21	11
81–85	11	12	10	4	18	4	8	6
86–90	8	2	2	1	9	3	4	0
91–95	2	3	0	1	1	0	0	0
Total No. Cases	442	391	335	287	442	391	333	286

Percentile Table of Average Percentile Ranks.

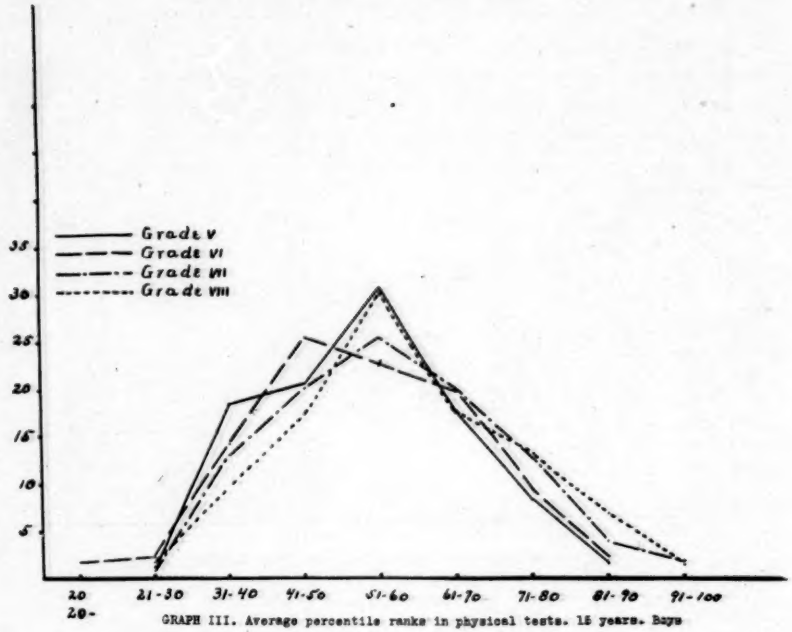
	Physical Tests				Mental Tests			
	Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15
Lower Limit	19.0	14.0	13.0	10.0	15.0	17.0	15.0	11.0
5	31.3	31.9	30.5	30.9	29.3	32.4	27.6	30.5
10	37.2	38.3	35.6	34.9	34.0	36.8	34.1	33.6
20	42.0	41.6	42.3	42.6	40.1	40.9	40.6	41.0
30	46.6	46.6	46.6	46.7	45.0	45.8	45.9	46.6
40	50.5	50.5	50.2	50.0	50.8	50.6	51.4	51.2
50	54.0	54.4	54.1	54.0	54.9	54.2	55.2	54.4
60	58.3	58.0	58.0	58.4	58.4	57.2	58.8	58.8
70	62.5	61.9	62.2	62.4	62.4	60.1	63.1	63.3
80	67.3	66.5	67.7	66.2	69.2	64.8	68.9	67.8
90	74.1	74.0	74.1	71.4	75.2	71.8	74.9	72.5
95	79.7	79.2	78.6	75.4	81.6	75.8	78.9	76.2
Upper Limit	94.0	92.0	88.0	92.0	93.0	89.0	88.0	85.0



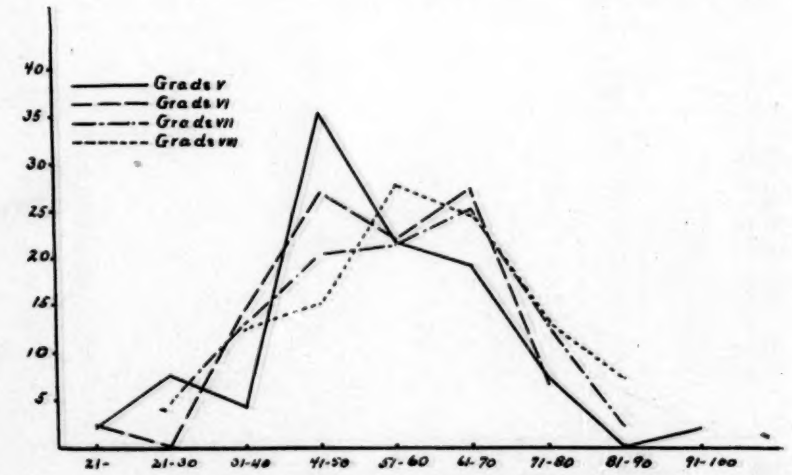
GRAPH I. Average percentile ranks in physical tests. 14 years. Boys.



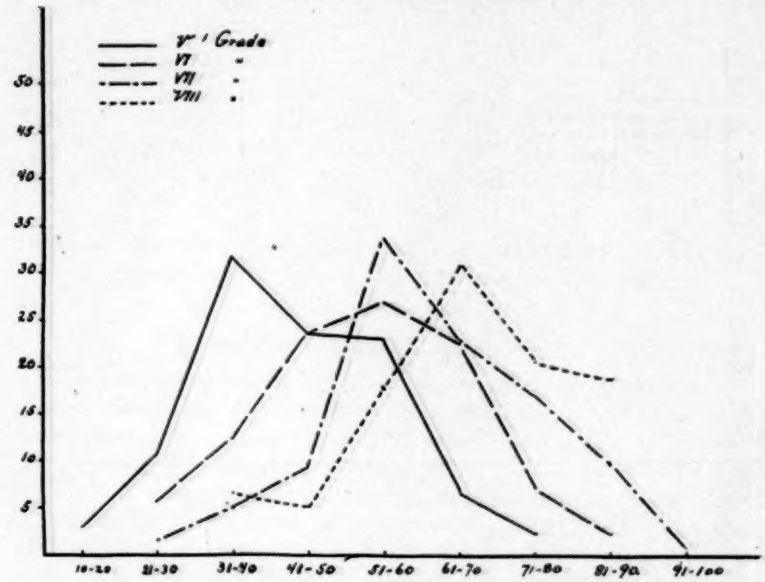
GRAPH II. Average percentile ranks in physical tests. 14 years. Girls.



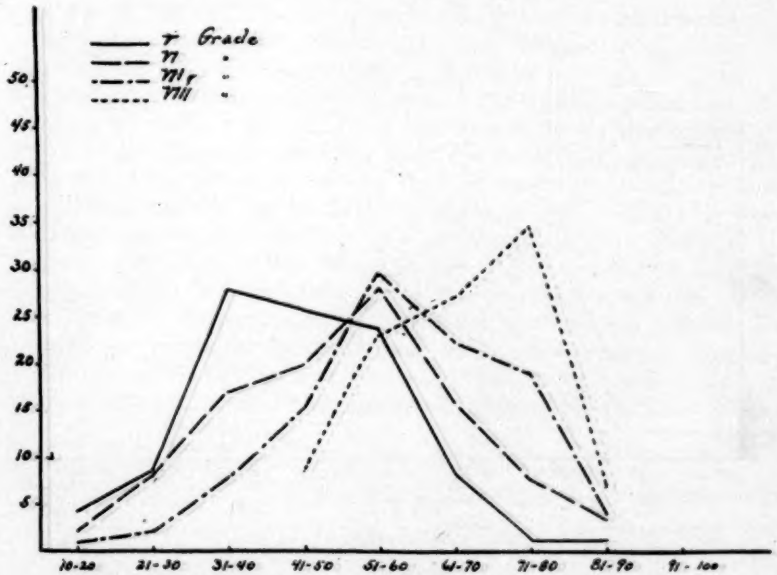
GRAPH III. Average percentile ranks in physical tests. 15 years. Boys



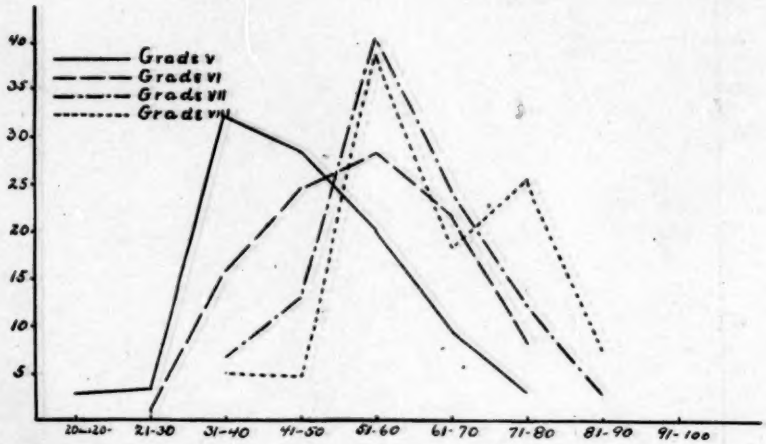
GRAPH IV. Average percentile ranks in physical tests, 15 years. Girls.



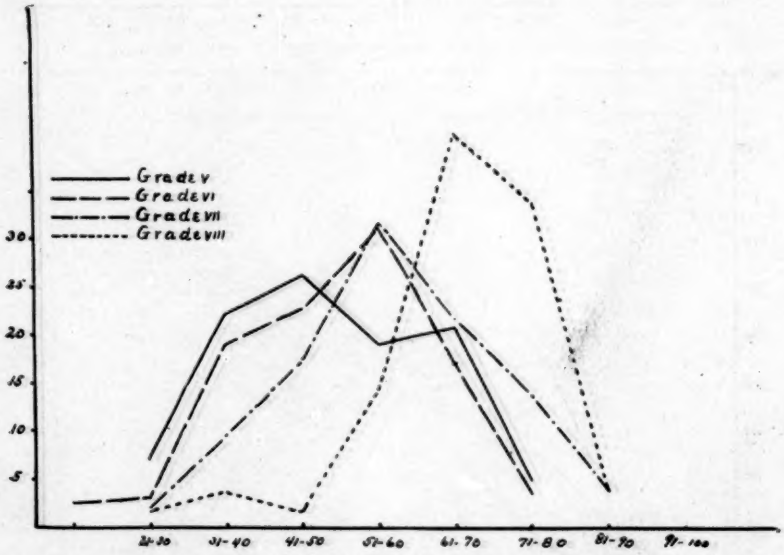
GRAPH V. Average percentile ranks in mental tests, 14 years. Boys.



GRAPH VI. Average percentile ranks in mental tests. 14 years. Girls.



GRAPH VII. Average percentile ranks in mental tests. 15 years. Boys.



GRAPH VIII. Average percentile ranks in mental tests. 15 years. Girls.

THE STANFORD REVISION OF THE BINET-SIMON SCALE AND SOME RESULTS FROM ITS APPLICATION TO 1000 NON-SELECTED CHILDREN

LEWIS M. TERMAN, GRACE LYMAN, DR. GEORGE ORDAHL, DR. LOUISE ORDAHL, NEVA GALBREATH, AND WILFORD TALBERT[1]

Stanford University

Sources of Data for the Revision

The purpose of this article is to summarize briefly an investigation undertaken for the improvement of the Binet scale, and to suggest some possible contributions of intelligence testing to the psychology of mental development.

The work has extended over a period of five years and has involved the examination of 1700 normal children, 200 defective and superior children, and more than 400 adults. The present discussion will confine itself, however, to an account of tests carried out with 1000 non-selected children.

Tests of 400 children had been made by Childs and Terman in 1910–1911, and of 300 children by Trost, Waddle and Terman in 1911–12. For various reasons, however, the results of these tests did not furnish satisfactory data for a thoroughgoing revision of the scale. Accordingly a new investigation was undertaken, somewhat more extensive than the others and more carefully planned. Its main features may be described as follows:

1. We assembled as nearly as possible all the results which had been secured for each test of the scale by all the workers of all countries. The result was a large sheet of tabulated data for each individual test, including per cents passing the test at various ages, conditions under which the results were secured, method of procedure, etc. After a comparative study of these data, and in the light of results we had ourselves secured, a provisional arrangement of the tests was prepared for try-out.

[1] The tests of 1000 children were made by Miss Lyman, Dr. and Mrs. Ordahl, Miss Galbreath and Mr. Talbert. Terman is responsible for the test series and for the analysis of results. The Stanford Revision will appear shortly as a joint monograph.

2. A plan was then devised for securing subjects who should be as nearly as possible representative of the several ages. The method was to select a school in a community of average social status, a school attended by all or practically all the children in the district where it was located. In order to get clear pictures of age differences the tests were confined to children who were within two months of a birthday. To avoid accidental selection, *all* the children of even-age were tested in whatever grade enrolled. Tests of foreign-born children, however, were eliminated in the treatment of results. There remained tests of approximately 1000 children, of whom 905 were between 5 and 14 years of age.

3. The children's responses were recorded verbatim. This made it possible to re-score the records according to any desired standard and thus to fit a test more perfectly to the age level assigned it.

4. Much attention was given to securing uniformity of procedure. A half year was devoted to training the examiners and another half year to the supervision of the testing. In the further interests of uniformity all the records were scored by one person (Terman).

In working out a revision of the scale based upon these data the guiding principle was to secure an arrangement of the tests and a standard of scoring which would cause the median mental age of the children of each age group to coincide with the median chronological age. If the median mental age at any point in the scale was too high or too low it was only necessary to change the location of certain of the tests, or to change the standard of scoring, until an order of arrangement and a standard of passing were found which would throw the median mental age where it belonged. We had already become convinced, for reasons too involved for presentation here, that no satisfactory revision of the Binet scale was possible on any theoretical considerations as to the per cent. of passes which an individual test ought to show in a given year in order to be considered standard for that year. Such a plan would doubtless be feasible or even preferable with a scale differently founded, but not with that of Binet.

As was to be expected, the first draft of the revision did not prove satisfactory. The scale was still too hard at some points and too easy at others. In fact, three successive revisions were

necessary, involving three separate scorings of the data and as many tabulations of the mental ages, before the desired degree of accuracy was secured.

As finally left, the scale gives a median intelligent quotient closely approximating 100 for our non-selected children of each age from 4 to 14. The revision contains six regular tests and from one to three alternate tests in each year from 3 to 10, eight tests at year 12, six at 14, and six in each of two higher groups which are named, in order, "average adult" and "superior adult."

The tests in the two highest groups were standardized chiefly on the basis of results from 400 adults.[1] The extension of the scale in the upper range is such that ordinarily intelligent adults, little educated, test up to what is called the "average adult" level. Adults whose intelligence is known from other sources to be superior are found to test well up toward the "superior adult" level, and this holds true whether the subjects in question are well educated or practically unschooled.

Enough new tests were included in the trial series to permit the elimination of tests which failed to meet the requirements and still to give the revision some 27 tests more than were in the original scale.

The following method was employed for determining the validity of a test. The children of each age level were divided into three groups according to intelligence quotient, those testing below 90, those between 90 and 109, and those with an intelligence quotient of 110 or above. The percents of passes on each individual test at or near that age level were then ascertained separately for these three groups. If a test fails to show a decidedly higher proportion of passes in the superior I Q group than in the inferior I Q group, it can not be regarded a satisfactory test of intelligence. On the other hand, a test which satisfies this criterion must be accepted as valid or the entire scale must be rejected. Henceforth it stands or falls with the scale as a whole.

When tried out by this method, some of the tests which have been most criticized showed a high degree of reliability; others

[1] Including 30 business men tested by H. E. Knollin and Richard Zeidler, 40 high school students tested by Terman, 150 "migrating unemployed" tested by H. E. Knollin, and 150 delinquents tested by Mr. J. H. Williams.

which have been most praised proved to be so little correlated with intelligence that they had to be discarded.

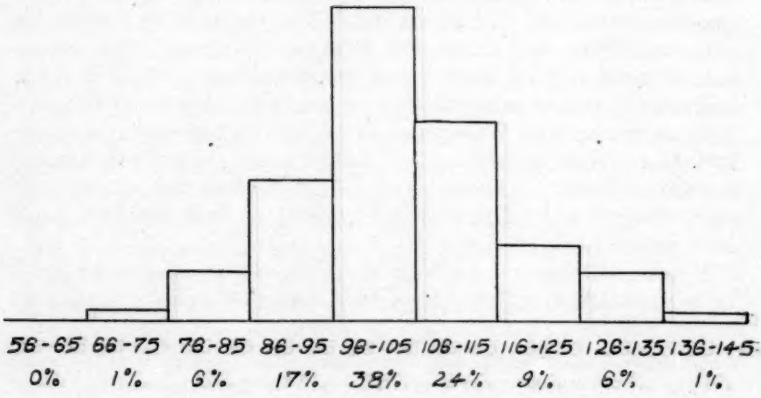
Next a brief summary of some results from the analysis of the data.

The Distribution of Intelligence

Because of failure to avoid the influence of accidental selection in choosing subjects for testing, most of the Binet studies have thrown little light on the distribution of intelligence. The method of securing subjects for the present study makes our results on this point especially interesting.

The intelligence quotients were calculated for the 1000 children and their distribution was plotted for the ages separately. The distribution was found fairly symmetrical at each age from 5 to 14. At 15 the range is on either side of 90 as a median, and at 16 on either side of 80 as a median, which is of course due to the fact that these left-over retardates are usually below normal in intelligence.

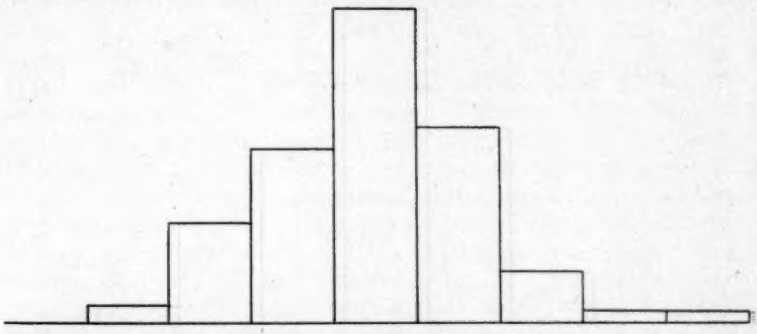
The I Q's were then grouped in ranges of ten. In the middle group were thrown those from 96–105; the ascending groups including in order the I Q's from 106–115, 116–125, etc. Correspondingly with the descending groups. Graphs 1–3 show the results of this grouping for the ages 6, 9, and 13 separately. Graph 4 shows the distribution for the ages 5–14 combined. Graph 5 shows also the distribution for all ages combined, but this time with the I Q's grouped by ranges of 20 points instead of 10 (50–70, 71–90, 91–110, 111–130, 131–150)



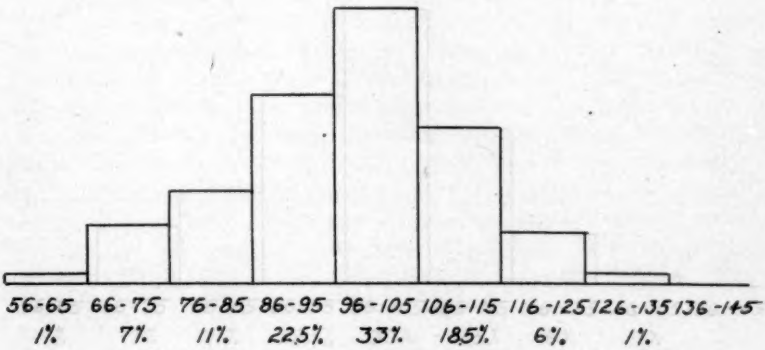
GRAPH 1. Showing distribution of I Q's of 117 non-selected 6-year-olds.

The distributions for the ages combined are seen to be remarkably symmetrical. The symmetry for the separate ages is hardly less marked, considering the fact that only 80–120 children were tested at each age. In fact, the range including the middle 50% of I Q's remains practically constant from 5 to 14 years.

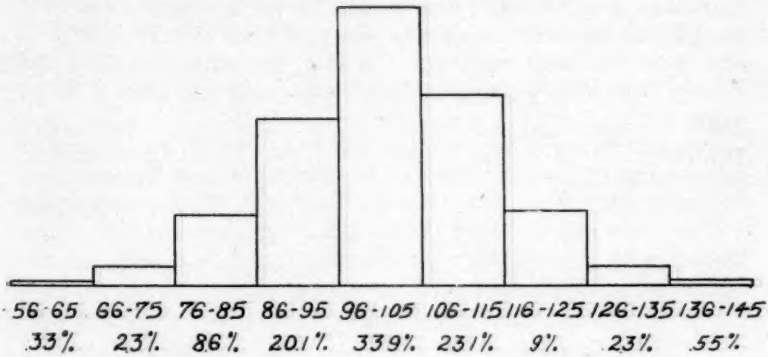
The traditional view that variability in mental traits greatly increases at or near the onset of adolescence is here contradicted as far as intelligence is concerned. Likewise the common opinion that deviations below normal are more frequent and more extensive than deviations above normal. It is found, for example, that for the ages 5–14 combined:



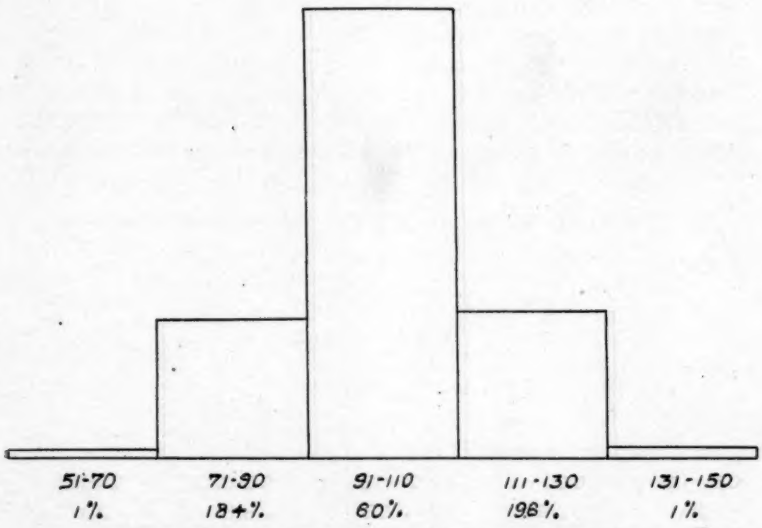
GRAPH 2. Showing distribution of I Q's of 113 non-selected 9-year-olds.



GRAPH 3. Showing distribution of I Q's of 98 non-selected 13-year-olds.



GRAPH 4. Showing distribution of I Q s of 905 non-selected children, ages 5--14 combined.



GRAPH 5. Showing distribution of I Q's of 905 non-selected children ages 5 -- 14 combined.

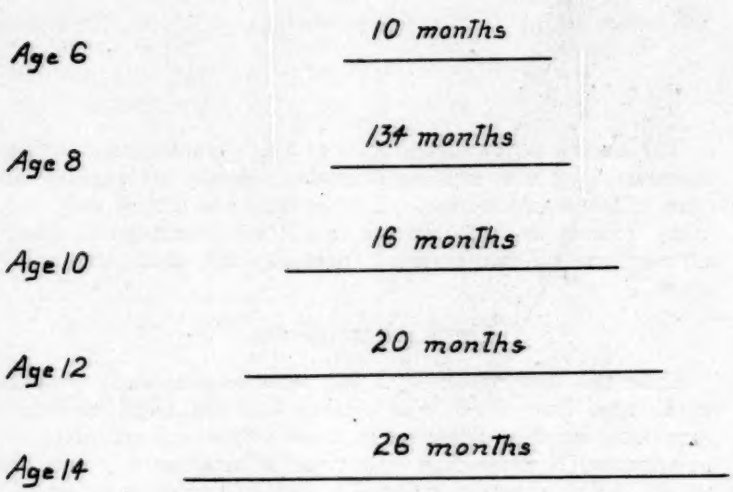
the lowest	1%	go to	70	or below;	the highest	1%	to	130	or above
" "	3%	" "	76	" "	" "	3%	"	125	" "
" "	10%	" "	85	" "	" "	10%	"	116	" "
" "	20%	" "	91	" "	" "	20%	"	110	" "

The nature of the distribution of I Q's emphasizes the hopelessness of our ever arriving at any universally acceptable definition of feeble-mindedness. The dividing line can be only arbitrary, exactly as would be the case if we attempted to classify all men into the two groups: "normally tall" and "abnormally short."

The Validity of the I Q

Since the distribution of I Q's remains practically constant at all ages from 5–14, it is evident that the usual method of expressing intelligence status in terms of years of retardation or acceleration is misleading. "A year of retardation" is a unit which has no constant value. A year of deviation at age 6 is exactly equivalent to a deviation of 18 months at age 9, and to 2 years at age 12, etc. This follows necessarily from the uniform nature of the distribution of I Q's in the different ages. The number of 6 year old children testing "at age" is approximately twice as great as the number of 12 year olds testing at age, and 50% greater than in the case of the 9 year olds. The range of months including the middle 50% of the mental ages increases at a fairly constant ratio from 6 to 14, as shown in Graph 6. These facts argue strongly in favor of the validity of the I Q as a means of method of expressing intelligence status.

The crucial experiment, of course, would be to test the same children several times during the period of mental growth in order to find whether the I Q remains constant. Unfortunately, the repeated tests which others have made for this purpose have involved the use of a very imperfect scale, the worst feature of which is that its inaccuracy is unequal at different age levels. We have found with the Binet scale of 1908 that an I Q of 110 at age 6 is no more than equivalent to an I Q of 100 at 9, or to 90 at 12. With a scale equally accurate at the different levels we are now in position to follow the actual development of children from year to year.



GRAPH 6. Showing range of months including the middle 50% of mental ages at various years.

Fortunately 18 children who were tested by Childs and Terman in 1911 were tested some two to four years later by the Stanford revision. When the I Q's resulting from the first test were corrected to accord with the shifting of tests in the revised scale it was found that no I Q of the second test differed more than 8 points from the corresponding I Q of the first test. The median difference was only 4. The superior children of the first test are found superior in the second, the average remain average, the inferior remain inferior, the feeble-minded remain feeble-minded, and always in approximately the same degree. Such facts give little support to the traditional belief that intelligence normally develops by alternate leaps and rests; that men of genius develop out of blockheads, and that genius children usually degenerate intellectually as maturity approaches.

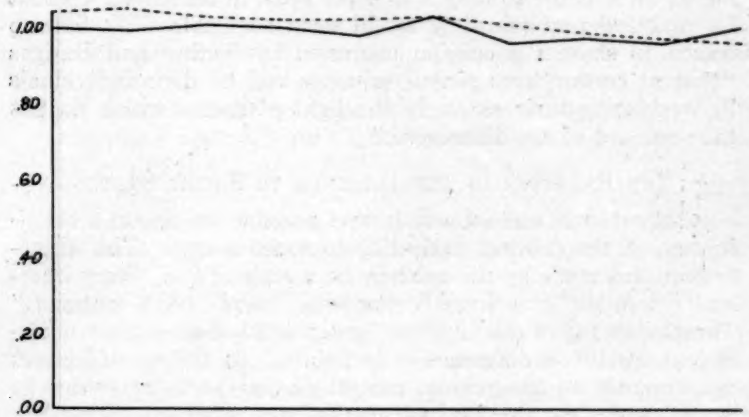
Incidentally it may be noted that if the I Q is a valid expression of intelligence, as it seems to be, then the Binet-Simon "age grade method" becomes transformed automatically into a "point scale method," if one wants to use it that way. As such it

would seem to be greatly superior to the Yerkes-Bridges scale, for it includes a much larger number of tests and its points have definite meaning and equal value.

If future investigations should confirm the validity of the I Q and its necessary corollaries, the practical consequences would be of the greatest importance, for accurate prediction of a child's later development would then become a matter of everyday practice.

Sex Differences

When the I Q's of the boys and girls are treated separately we find a small but fairly constant superiority of the girls up to age 13. At 14 the median I Q for the girls drops suddenly below that for boys. This is shown in graph 7.



	5	6	7	8	9	10	11	12	13	14
Boys	1.00	.99	1.01	1.00	.98	1.03	.96	.97	.96	1.00
Girls	1.04	1.05	1.03	1.02	1.02	1.03	1.01	.99	.97	.96

GRAPH 7. Showing median I Q for boys and girls separately at each age. (Total number of boys 457; total number of girls 446)

Apart from the slight superiority of the girls, the distribution of intelligence in the two sexes is not different. The supposed wider variation of boys is not found. The girls do not group themselves about the median more closely than the boys. The

range including the middle 50% is approximately the same for the two sexes.

The supplementary data, including the teachers' estimates of intelligence on a scale of five, the teachers' judgments in regard to the quality of the school work, and records showing the age-grade distribution of the sexes, were all sifted for evidence as to the genuiness of the apparent superiority of the girls age for age. The results of all these lines of inquiry support the tests in suggesting that the superiority of the girls is probably real even up to and including age 14, the apparent superiority of the boys at this age being fully accounted for by the more frequent elimination of 14 year old girls from the grades by promotion to the high school.

However, sex differences in intelligence are so small (amounting on an average to only 2 to 4 per cent. in terms of I Q) that for practical purposes they would seem negligible. We find no reason to share the opinion expressed by Yerkes and Bridges "that at certain ages serious injustice will be done individuals by evaluating their scores in the light of norms which do not take account of sex differences."

The Relation of Intelligence to Social Status

In about half our schools it was possible to obtain a classification of the children according to social status. This classification was made by the teachers on a scale of five, "very inferior," "inferior," "average," "superior," and "very superior." The median I Q of the "inferior" group is 93, that of the "superior" group 107; a difference of 14 points. At the age of 7 years this amounts to one year in mental age; at 14 to two years in mental age. By the Pearson method the correlation between intelligence and social status is .40, a result which is fully in harmony with the earlier findings of Binet workers.

The usual assumption has been that such correlation is the artificial product of environmental influences; that the child from a superior home does better because he has had more opportunity to pick up the information needed for success in the tests. A careful sifting of the data has forced upon us the conclusion that the greater part of the difference found is due to an actual average superiority in the endowment of better-class children.

The results of the tests on this point were confirmed by five separate lines of inquiry: (1) The amount of correlation between I Q and social status for children of different ages; (2) a comparison of social status with the teachers' estimates of intelligence; (3) a similar comparison with the teachers' judgments as to the quality of the school work; (4) a comparison of the age-grade status of the children of different social classes; and (5) case studies of exceptionally intelligent and dull children in the same family. The correlation of social status with the teachers' estimates of intelligence was .55, and with the quality of school work .47. The correlation between I Q and social status was .43 for the younger children, .40 for those in the middle years, and only .29 for the older. *In other words, the longer the supposed influence of home environment lasts the more independent of it the I Q becomes.*

These facts and others too involved for presentation here point to the conclusion that the correlation of I Q with social status rests upon actual differences in endowment. In the light of the data available we are unable to agree with the contention of Meumann and of Yerkes that it is unfair to judge the intelligence of any child except in terms of the average intelligence of his own social class. It would seem to us just as logical to insist that it is unfair to the dull or feeble-minded child to judge his intelligence with reference to standard intelligence for normals.

The Relation of Intelligence to School Success

Three questions are taken up in this connection: (1) The correlation of I Q with the quality of school work as judged by the teacher; (2) The relation of mental age to grade progress; and (3) The correlation of I Q with the teachers' estimates of intelligence. The correlation with school work is .45, that with teachers' estimates of intelligence .48. Between mental age and grade there are many disagreements, most of which are traced to the tendency of the school to promote children by age rather than by ability.

While these correlations are high enough to confirm in a general way the validity of the Binet method, serious disagreements were found in a considerable number of individual cases. For some of the comparisons about one case in ten showed a disagreement of two steps; that is, where the I Q would have stamped a

child as belonging to the "very inferior" group, for example, the grade progress, or the teacher's judgment of the child's school work, or her estimate of intelligence would put the child in the "average" group, two steps removed, or vice versa.

Inasmuch as findings of this kind have led some to question the value of the Binet rating, it seemed worth while to ascertain the causes of such disagreements. Individual study of these cases showed beyond question that practically every two-step disagreement could be fully explained without questioning the validity of the intelligence test. They were due, in the main, to the teacher's neglect to take account of age differences in rating children's intelligence or school work. Time and again, older retarded who were plainly at the borderline of feeble-mindedness were rated "average" or only "slightly inferior" in intelligence and school work. If the child does ordinarily well the school work where he happens to be located the tendency of teachers is to rate his intelligence and school success "average" regardless of age. Conversely, the intelligence and school success of children who are below age for their grade are constantly underrated by the teacher. The study of grade progress in relation to mental age showed that the over-age dull children whose retardation has been so much lamented are as a rule not retarded, but actually accelerated. Under-grade according to chronological age, they are usually over-grade according to mental age. It appears, therefore, that by far the most common retardation is that due to the failure of teachers to recognize and advance the child of superior ability.

In closing, the opinion is ventured that the measurement of intelligence has already progressed far enough to warrant the testing of every child at the very beginning of his school career in order to determine the direction and extent of his deviation from median intelligence. Certainly all will agree that there is no other fact of greater significance for a child's educational guidance.

ABSTRACTS AND REVIEWS

TRUMAN LEE KELLEY, PH. D. *Educational Guidance. An Experimental Study in the Analysis and Prediction of Ability in High School Pupils.* Teachers College, Columbia University, Contributions to Education, No. 71. New York: Teachers College, Columbia University, 1914. Pp. iv, 116. $2.00.

No field to which statistical analysis has been applied has been more attractive than that of the study of relationships. The extent to which characteristics and traits vary together has always been one of the sorts of inquiry which have been thought to be most worth while. The accepted means, however, by which the amount of relationship between measurements has been expressed, while mathematically satisfactory, has proved to have restricted practical value. To say that ability in mathematics and ability in science are correlated to such an extent that equals 0.75, leaves a great deal to be desired; and arguments based thereon will be stated very much in accordance with the personal bias of the individual making the argument.

Beyond knowing that +1 means perfect direct correlation, —1 perfect inverse correlation, and 0 absence of correlation, there is little to be said that is convincing. The amount of change which may be expected to take place in a second characteristic when a first one is subjected to a unit change is a question upon which the correlation coefficient throws no light.

In this book, however, we have an extension of the method of statistical analysis beyond the conventional correlation coefficient. By a method which has hitherto been largely confined to speculative treatises, the various r-values are converted into coefficients of regression, and these, when substituted in the general equation of the line of regression, constitute an expression whereby changes in one variable may be shown to imply a definite amount of change in another. In this sense, Dr. Kelley's book stands for a great idea and one which we predict will, in the future, be increasingly present in statistical inquiry. Of course, the regression equation is no new thing as a matter of theory. Its practical application, however, has been almost negligible.

In this book the practical application of the regression equation is concerned with the extent to which the past performances of pupils and the estimates of teachers may be systematically used for "differential prognosis," *i. e.*, for a precise determination of the future performances and capabilities of individuals. Records are available for 59 pupils from the fourth grade of the elementary school through the first grade of the high school, together with the estimates of teachers concerning the ability of the children. There is likewise available, not only for these 59 children, but also for a much larger group, the results of specific tests conducted by the author.

The problem, then, becomes this: Knowing the former grades of pupils, the estimates of their teachers about them, and the results of special testing, what inference concerning their ability in high school work may be drawn, and how does this inference agree with the known performance of the children in their first year in the high school? For this purpose, the estimates of teachers and the results of special tests were found to be considerably inferior to the records of the children for the last four grammar grades. Indeed, the estimate of the probable high school standing, when based upon the grades of the children in the elementary school, was so closely in agreement with the actual standing of the pupils that the correlation was about 0.8, with a probable error of 0.032.

The suggestion is very properly made by Dr. Kelley that pupils' record cards should contain the pupil's rating in each grade. It is indeed true, as he points out, that "a pupil's school record is the most complete, detailed, and accurate of all records of the ordinary pupil, from his entrance in school to his entrance into work." The time, however, is still far distant when pupils' record cards may be expected to contain "a definite statement of the significance of the grades in terms of a normal distribution, or as deviations from the grade mean for the local system in question, expressed as multiples of the variability for that system." Considering the fact that record cards containing the school history of a child are themselves not yet generally introduced, this refinement will, no doubt, have to be reserved for a distant future.

The book about which we are speaking has its faults, and they lie pretty much on the surface. The special tests are not wholly satisfactory, and the scheme of rating them is clumsy; few persons in practical school work could use it. The system of notation with respect to correlation coefficients and coefficients of regression is not

only inelegant from a mathematical point of view, but it does not gain in clearness what it sacrifices in elegance. Considering the character of the persons who will read the book, a consistent appeal to the narrow circle of statistical students only would perhaps have been better. In particular, we should have liked to see a more detailed statement of the calculations by which the regression equations were derived. We take it that the greatest use of Dr. Kelley's book will be stimulation of the kind of analysis, the method of treatment, which he has used; and we regret that he has not introduced greater details concerning his way of working. This he was in a peculiarly favorable position to do. We know of no one who has worked out so many regression coefficients of higher order as he has. The method of doing this is not simple, although it is capable of a simple statement for practical purposes. The labor of calculation is great, though it may be materially reduced if special tables are devised. For instance, a valuable table might be made giving the values and logarithms of the characteristic expression $(1-r^2)^{\frac{1}{2}}$, for given values of r. In short, Dr. Kelley's experience has given him unusual opportunities to assist other workers who may wish to employ his methods.

What has just been said is not to be taken as indicating any failure on our part to realize the unusual excellence of Dr. Kelley's work. He has given a startling instance of one more way in which statistical analysis may serve educational ends. That he has not taught us more about his method we may regret, but, at the same time, we should remember the limitations, both as to space and expense, in the publication of a doctor's dissertation.

B. R. BUCKINGHAM.

Chief Statistician, New York City Schools.

ED. CLAPARÈDE. *Tests de développement et tests d'aptitudes.* Extrait des Archives de Psychologie, 14: 1914, pp. 101–107.

The problem raised here is one of the interpretation of the outcome of tests of intelligence. Suppose a child fail to pass a given test which is passed on the average by other children of his age: does this indicate that the child is *below* his mental age? Evidently not, because it may indicate merely that he is *other than* the average child of his age. In the former case the test may be said to measure mental *development*, in the latter mental *aptitude*. If a 12-year-old child does poorly at singing or drawing, to take an obvious illustration, no one would regard this as clearly significant of mental retardation. To

be sure, if our age differences are large enough, say 5 and 12 years, the differences in performance even in singing or drawing, would be primarily developmental differences, but if our age differences are small, say 11 and 12 years, the share in mental performances attributable to development becomes more uncertain.

The question then arises: how are we to know whether a given mental test is a test of development or a test of aptitude. *A priori* speculation, like the divisions of the Binet tests suggested by Meumann and others, is, in Claparède's opinion, less reliable than some objective criterion. And this criterion he would find in the empirical distributions of the results actually obtained from tests as conditioned by age. Thus, if the curves of distribution for a given test when applied to 10-year and to 11-year children are distinctly separated from one another, the dependence of the test upon age is clean-cut and well established; if the curves are identical there is no dependence on age. In actuality, since such distributions overlap to a greater or less extent, the question becomes: what amount of overlapping may be permissible in tests which are regarded as diagnostic of developmental status? To this query, the author replies that a difference between the averages of the two adjacent years amounting to the magnitude of the probable error of the means, or even of twice the probable error, is certainly not sufficient to regard the test as characteristic of the age in question. Perhaps, he thinks, a difference of four times the probable error may be sufficient.

The reviewer would suggest that the reliability of the differences between the means established for adjacent ages by any mental test would very naturally be determined by the mathematical formulas for calculating the reliability of differences of means generally. For scientific purposes it is conceded that any measure, to obtain credence, ought to be three, or better four, times its probable error. A difference in the averages of two adjacent ages amounting to four times its probable error would appear by chance once in 143.3 times. We have, therefore, already at hand a mathematical justification for the recommendation that Dr. Claparède makes tentatively from inspection of curves of distribution. A good illustration of the application of the issue raised here is afforded by the results reported in the reviewer's *Manual of Mental Tests*, 2d edition, Part II, page 658, where it appears that the Ebbinghaus completion test exhibits no progress with age (from 13 to 19 years) but a decided progress with school grade (8th to 12th). G. M. W.

THE

JOURNAL OF EDUCATIONAL PSYCHOLOGY

INCLUDING EXPERIMENTAL PEDAGOGY, CHILD PHYSIOLOGY AND HYGIENE, AND EDUCATIONAL STATISTICS

Edited by

W. C. BAGLEY, C. E. SEASHORE,
J. CARLETON BELL, Managing Editor GUY MONTROSE WHIPPLE.

Published monthly except July and August by

WARWICK & YORK, INC.,
LANCASTER, PA. BALTIMORE, MD.

Manuscripts for publication, books or other material for review, and news items of interest to educational psychologists should be addressed to The Managing Editor, J. Carleton Bell, University of Texas, Austin, Texas. Research contributions from England may be sent to W. H. Winch, Esq., Melville Villa, Overhill Road, Dulwich, London.

The Journal is issuing a series of Monograph Supplements for the publication of more extensive researches in educational psychology. For details prospective contributors may apply to Guy Montrose Whipple, University of Illinois, Urbana, Ill.

The price of the Journal is $2.50 per year of ten monthly issues. Foreign postage is 20 cents extra for Canada and 30 cents for other countries in the Postal Union.

Subscriptions and correspondence concerning business matters should be sent to Warwick & York, Inc.

VOLUME VI NOVEMBER, 1915 NUMBER 9

EDITORIAL

THE PROBLEM OF SENSE TRAINING

Most of us would agree that the cardinal problem raised in educational psychology is the nature and limitations of training. Special aspects of this general problem, notably the problem of formal discipline, or the transfer of training, and the effect of practice upon the acquisition of skill, have received extensive consideration. But one of the primary aspects of the problem, that of the training of the senses, has had curiously little discussion, if a somewhat hasty survey of the textbook literature is any criterion. On the other hand, much of the current philosophy of education—in so far as modern kindergarten practice or the methods of "educating" the feeble-minded or the Montessori fad may be said to have any philosophy of education—seems to take it for granted that devices for training the senses of young children are both necessary and valuable. Without attempting to deny that in some instances systematic instruction in the handling of concrete objects may produce a noticeable and measurable improvement in the capacity of young children to identify objects

surely and quickly, to distinguish small differences in pitch, color, form, weight, etc., or to estimate lengths, durations, weights, etc., I should like to interpose the following objections against the doctrine of sense training as commonly interpreted. (1) To take the doctrine so literally as to advocate the presentation to the infant of as many as possible of the thousands of sense impressions themselves (the 11,000 tones, the 35,000 colors, the four tastes, etc.) is a manifest absurdity, because, even if it were possible, as some extremists think, to develop in this way correspondingly many brain cells, the net result would not be to augment by one jot or tittle the natural development of intelligence. (2) Nature has provided in the guise of numerous instinctive tendencies (particularly those evinced in play) a very efficient machinery for provoking and promoting acquaintance with the world about us as fast as the central nervous system can proceed with the acquainting process. It may be debated, then, whether we need to "carry coals to Newcastle" in an endeavor to assist or hurry this process. (3) Nature has also provided a curious surplusage of efficiency in our sense-organs as it is. The normal ear can discriminate differences of pitch much smaller than the smallest musical interval. The skin can discriminate a fraction of a degree, Fahrenheit. The eye can detect a brightness difference of one one-hundredth. (4) In those individuals whose sensory mechanism is so defective as to fall far short of these normal capacities no amount of subsequent "education" seems to remedy the deficiency—witness color-blindness or tonal deafness. (5) When we do encounter instances in which systematic training appears to have improved the performance of the senses, we invariably, so far as my knowledge goes, locate the improvement in some one or more central factors, like direction of attention, ability to understand what is to be looked at, or listened to, or smelled of—witness any careful experimental analysis of the factors that condition improvement in observation or discrimination. Here again, then, there is, *sensu stricto*, no such thing as "sense training."

All in all, it would appear that a careful critique of the doctrine of sense training would be a very acceptable contribution just now to the literature of educational psychology.

G. M. W.

NOTES AND NEWS

The University of Indiana announces the establishment of a Bureau of Co-operative Research in Education. Its purpose is to assist superintendents, principals, and teachers in the scientific study of educational problems and to collect and publish such material and investigations as will further the growth of educational science. For the year 1915–16, it announces work along the following four lines: (a) studies in arithmetic by means of the Courtis Standard Tests, series B; (b) studies in reading, by means of the Thorndike Reading Scale; (c) studies in spelling, by means of the Ayres and Buckingham spelling scales; (d) studies in unit cost of high school instruction. The work of the bureau is under the direction of Associate Professor, M. E. Haggerty.

Calls for educational tests from schools and colleges from Kansas and other states have been received in large numbers by the Bureau of Educational Measurements and Standards of the Kansas State Normal School at Emporia. Over seventy-five applications have been made in the last six months. The tests comprise reading, writing, arithmetic, spelling, drawing, composition, and vocabulary tests.—*School and Society.*

Dr. David Spence Hill, director of the bureau of educational research, New Orleans public schools, is engaged in a first-hand study of the system of instruction prevailing in the schools. As a part of this survey, he is spending an entire day with a typical class of each grade, in order, as far as possible, to become familiar with the work of the grade from the standpoint of the pupil. Other phases of the survey deal with the program of study, the subject matter of the texts used, tests of the accomplishment of New Orleans pupils as compared with those of other cities in spelling and arithmetic, a study of promotional examinations, and vocational studies. The clinical studies of individual children will be continued, and statistical measurements of the whole system will be carried on.

The School Lunch Committee of the Home and School League of Philadelphia has disbanded after an existence of eight years. Its

work of experimentation and demonstration has resulted in the establishment of lunches in the elementary schools of the city, and in their successful maintenance on a self-supporting basis. The work has now been taken over by the board of education and has been made an integral part of the school organization. At the May meeting of the board, the final recommendations of the School Lunch Committee were adopted, and the superintendent of schools was authorized to extend elementary lunch service immediately to twenty-five additional schools. The final report of the committee, a pamphlet of sixty-three pages, is a valuable contribution to the subject, giving a history of the movement, typical menus, and costs of service.

The Municipal University of Toledo, Ohio, is offering twelve two-hour courses in education at hours convenient for the teachers of the city. Among these courses are "History of Education," and "Problems of Educational Administration and Supervision," by Professor David Henry; "Stories and Story Telling," "Teaching Upper-Grade Arithmetic and Language," and "Principles of Teaching," by Professor Josephine Leach, and "Secondary School Organization and Management," "Principles of Education," and "Adolescence," by Professor A. W. Trettien.

Courses for teachers, at convenient Saturday forenoon or afternoon hours, and primarily for the benefit of Cleveland and vicinity, will be given at Western Reserve University during the present semester. The course were organized October 2. College credit may be given to those satisfying entrance and other conditions.—*School and Society.*

At Tufts College Professor Karl Schmidt, head of the department of education, is offering a course in principles of secondary education to those seniors who are planning to enter the teaching profession. An agreement has been reached with the Somerville School Committee to extend to students the privilege of attending the high school for observation and for engaging in practice teaching. In return for this privilege the college will give free teaching courses to teachers in the Somerville schools.—*School and Society.*

In New York City the Board of Estimate has refused to sanction a larger appropriation for school purposes than was voted last year.

Comptroller Pendergast, chairman of the Board's committee on education, has recommended an extension of the school year to forty-four weeks, a lengthening of the school day from five to six hours, the total elimination of extra pay to teachers for service in vacation schools, a reduction of ten per cent in the number of positions for teachers, promotion of teachers on the basis of merit alone, and the reduction of the common school course from eight to seven years. He heartily commends the application of the Gary plan, and believes that the school system would be improved and the city saved much money by the changes suggested.

Professor W. C. Ruediger has been appointed Director of the newly authorized summer school to be held by George Washington University at Washington, D. C. The school for 1916 will begin June 26th and continue for six weeks.

Miss Anna J. McKeag, for four years president of Wilson College, has resigned that position to accept the professorship of the history and principles of education, at Wellesley College.

Mr. Ernest O. Holland, superintendent of schools at Louisville, Kentucky, has been elected to the presidency of Washington State College. He will succeed Dr. Enoch A. Bryan, who will retire next January.—*School and Society.*

During the latter part of October Professor M. V. O'Shea of the University of Wisconsin delivered a number of addresses in the East. He gave two addresses in Boston, one to a convention of Secondary School Masters and Teachers in Tremont Temple, and one to the Home and School Association affiliated with the Boston Latin School. He gave addresses also to the faculty and students of the Hotchkiss School in Connecticut.

Arnold Gesell (Ph. D., Clark University, 1906) has completed the medical course at Yale University and has been appointed professor of child hygiene in the Yale Graduate School. After a year's leave of absence he will serve also as State Inspector of Special School Children under the Board of Education of Connecticut. This is the first state to designate a separate inspector for special school children and indicates a commendable disposition on the part of the

state board to adapt the supervision exercised by the state over the schools to the needs of all pupils. It is to be hoped that the term "special school children" will not be limited to those who deviate from their fellows on account of defects, but that it may also be the duty of the inspector to pay some attention to specially gifted children. The opening for Dr. Gesell is a splendid one, and he is well fitted both by training and by experience to give the state excellent service.

Dr. Joseph E. DeCamp, last year assistant in the department of psychology at the University of Illinois, has been appointed instructor in psychology at the University of California. His place at Illinois has been filled by the appointment of Mr. Gerold Wichmann, A. B., of the University of Chicago.—*School and Society.*

The twenty-fourth annual meeting of the American Psychological Association will be held at the University of Chicago, December 28, 29 and 30, 1915. The annual dinner-smoker with the address of the president, Professor John B. Watson, on "The Place of the Conditioned-Reflex in Psychology," will occur at the Quadrangle Club, Wednesday evening, December 29. A special feature of the program will be a discussion of the relations of psychology to the subjects of philosophy, of science and of pedagogy in the curriculum. The local member of the executive committee, in charge of the meetings, is Professor H. A. Carr of the University of Chicago. Communications which concern the program may be addressed to the secretary, Professor R. M. Ogden at Lawrence, Kansas.

The following committees of the Society of College Teachers of Education for 1915–1916 have been announced:

Committee on School Surveys (Continued): M. B. Hillegas, Columbia University; Alexander J. Inglis, Harvard University; H. W. Josselyn, University of Kansas; Chas. H. Judd, Chicago University; E. C. Moore, Harvard University, chairman.

Committee on Organization Plan of Placing Bureaus of Colleges and Universities: Will G. Chambers, University of Pittsburgh; Lotus D. Coffman, University of Minnesota; V. A. C. Henmon, University of Wisconsin; H. W. Josselyn, University of Kansas; W. H. Kilpatrick, Columbia University; Edward E. Rall, University of Tennessee; H.

D. Sheldon, University of Pittsburgh; Frank E. Thompson, University of Colorado, chairman; A. S. Whitney, University of Michigan.

Committee of Securing Uniform or Better Practice with Reference to Issuing State Certificates to College Graduates: William H. Black, Indiana University; H. T. J. Coleman, Queen's University, Ontario; W. W. Charters, University of Missouri; E. L. Holton, Kansas Agricultural College; Charles H. Johnston, University of Illinois; Bruce R. Payne, George Peabody College for Teachers; Harlan Updegraff, University of Pennsylvania, chairman.

Committee on Methods of Practice Teaching for Future Secondary Teachers: Fred C. Ayer, University of Oregon; H. C. Dorcas, University of Iowa; Alexander J. Inglis, Harvard University, chairman; T. J. Kirby, University of Pittsburgh; A. R. Mead, Ohio Wesleyan University; Junius L. Meriam, University of Missouri; Samuel Chester Parker, University of Chicago; Wm. F. Russell, George Peabody College for Teachers.

Standardizing Colleges, Schools and Departments of Education: Carter Alexander, George Peabody College for Teachers; Edward C. Elliott, University of Wisconsin; Charles Fordyce, University of Nebraska; W. W. Kemp, University of Montana; Paul Monroe, Columbia University, chairman; Edward E. Rall, University of Tennessee; A. S. Whitney, University of Michigan.

Committee on Proposal for Uniform Nomenclature in Education: W. C. Bagley, University of Illinois, chairman; W. W. Charters, University of Missouri; Edward C. Elliott, University of Wisconsin; Ernest N. Henderson, Adelphi College; Henry Suzzallo, Columbia University; G. M. Wilson, Iowa Agricultural College; John M. Withers, Harris Teachers College.

Committee on Rating of Normal Schools in Relation to Departments of Education in Colleges and Universities (Continued): Carter Alexander, George Peabody College for Teachers; F. E. Bolton, State University of Washington; James J. Doster, University of Alabama; W. A. Jessup, University of Iowa, chairman; Charles Hughes Johnston, University of Illinois; W. C. Ruediger, George Washington University; G. D. Strayer, Columbia University; Harlan Updegraff, University of Pennsylvania.

CURRENT PERIODICALS

SCHOOL REVIEW. Vol. XXIII, No. 2, February, 1915. J. H. MINNICK. *A Comparative Study of the Mathematical Abilities of Boys and Girls.* 73–84. A comparison of the class grades in the mathematics work of 150 boys and 243 girls in the Bloomington, Indiana, high school. The author also studied the relative achievements of boys and girls in mathematics in comparisn with their standing in other subjects, as English, history, language, and science. The results show very little difference in achievement between boys and girls. Among the retarded student mathematics gives slightly more trouble to girls than to boys, and it is a slightly stronger factor in the elimination of girls than in the elimination of boys. On the whole, mathematics would seem to be about as well suited to girls as are history and science.

No. 3. March, 1915. WALTER S. MONROE. *A Test of the Attainment of First Year High School Students in Algebra.* 159–171. A series of six tests involving simple algebraic equations with numerical coefficients and numerical denominators were given to twelve classes of first year students in two city high schools. The class averages and average deviations are given for all the tests, and a more extended study is made of the results of the sixth test. The correlations of the various tests with each other are relatively small, indicating that each test calls for a different ability. The coefficient of correlation between the number attempted and the number right is high, indicating that speed and accuracy go together.

No. 6. June, 1915. W. F. ROECKER. *An Objective Study of the Rating of Traits in School Achievement.* 406–410. In the Wisconsin High School of the University of Wisconsin, report cards are issued every six weeks, and these reports indicate not only the rating of the pupils in scholarship, but also in industry, initative, attention, attitude, and improvement. A table is given presenting the records of a typical class. The author finds the correlation between scholarship and the other traits to be high. The plan enables the pupil to determine his own weaknesses, furnishes the teacher with a useful record of judgments on the pupil's attainments, and makes it possible to approximate closely the native ability of the pupil.

No. 8. October, 1915. RALEIGH SCHORLING. *The Problem of Individual Differences in the Teaching of Secondary School Mathematics.* 535–549. An account of the methods used in various institutions to train practice students to meet the individual differences of high school pupils. The latter part of the article is devoted to an account of an experiment in the use of bright students as in-

structors of slow students. A group of second year high school pupils was divided into two sections of approximately equal ability. A series of twelve lessons, identical in content, was given to the two sections. One-third of the recitation period was taken by the instructor in an inductive presentation of the subject; for the remaining two-thirds of the period the pupils of section B worked independently under the supervision of the instructor. The students of section A, on the other hand, worked in groups at desks and at the blackboard. In the latter section the instructor discouraged independent work. After eight recitations, the two classes were given the same examination, and a similar test was made after the twelfth recitation. Papers were graded by the instructor's colleagues. For a second series the method was reversed; and at the close of the test, another examination was given. In each case the section that studied independently showed a decided increase in the variability of the distribution of the pupils. This increase was correspondingly diminished as soon as the pupils began to work together again in groups.

SCHOOL AND SOCIETY. Vol. I, No. 2. January 9, 1915. GREGORY D. WALCOTT. *A Statistical Study of Doctor of Philosophy Men.* 66–71, and 102–107. The article presents a comparison of the number of men taking the bachelor's degree with those taking the doctor's degree in typical universities of the country in the two decades, 1885–1904. Tables are given showing the average number of years of study for each of the degrees, the coefficients of correlation for each college, and the place where the advanced degree was taken. In the second installment, the study is extended to include the subsequent careers of doctor of philosophy men, and their attainments in active life. The ratio of college graduates to those who obtain doctor's degrees is one to twenty-two, and this gives prospect of remaining fairly constant.

No. 4, January 23. JOHN PERRY. *The Need of a Science of Education.* 114–126. The president of the Educational Science section of the British Association for the Advancement of Science proclaims that the science of education is still to be created. The address is a severe arraignment of contemporary education in England. The author pleads for more attention to English and science, and less emphasis on the classics.

No. 6, February 6. FRANK W. BALLOU. *The Function of a Department of Educational Investigation and Measurement in a City School System.* 181–190. The author believes that the function of such a department is three-fold: first, a definition of minimum essentials in each subject of the course of study; second, the establishment of objective standards of achievement for the benefit of both pupils and teachers; third, scientific experimentation in methods of instruction, as a means of improving the work of the school. The article outlines the work attempted in Boston in the subjects of arithmetic, spelling, geography, and English, and in the rating of teachers according to merit.

No. 10. March 6. HENRY S. PRITCHETT. *Standards and Standardizers.* 336–339. A defense of the attempts of the Carnegie Foundation to devise standards for indicating the work done by high schools and colleges; and a discussion of the significance of the establishment of standards in education.

W. H. PYLE. *The Mind of the Negro Child.* 357–360. An account of the application of Pyle's tests for memory, rate of learning, association, and reaction to ink blots to four hundred and eight negro children in Missouri public schools. Tables are presented giving the average response for negroes and whites in each test at each year of age from eight to sixteen for boys and girls separately. White boys are invariably superior to colored boys, ranging from a very slight superiority in the cancellation test to four times as good a response in the genus-species test. Negro girls are slightly superior to white girls in the cancellation test, but are inferior in all other tests. The disparity is again greatest in the genus-species test, with a ratio approximating one to three.

No. 11. March 13. WALTER S. MONROE. *Measurements of Certain Algebraical Abilities.* 393–395. A brief account of the study of the ability of first year high school students to deal with simple equations, reported in greater detail in the School Review. The author concludes that increased accuracy is due to increased interest in the subject and to the reduction of knowledge of fundamental rules to the plane of automatic application.

No. 12. March 20. EDWARD L. THORNDIKE. *The Relation Between Initial Ability and Improvement in a Substitution Test,* 429–431. The article deals with the results of the practice of one hundred twenty-three college students in writing the products of two-place by two-place numbers. The author concludes that it is unsafe to assume that individual differences are due chiefly to the different opportunities which the individuals have enjoyed, and that the result of a given amount of practice is highly prophetic of the status which will be obtained by any given amount of additional practice.

No. 13. March 27. S. A. COURTIS. *Objective Standards as a Means of Controlling Instruction and Economizing Time.* 433–436. The author points out the importance of both speed and accuracy for efficiency of work in any field of practical endeavor and considers certain consequences of the establishment of objective standards in educational work. The first of these is the doctrine of the limitation of training, according to which there is a point in each pupil's development beyond which the returns of accomplishment are so limited as to make the expenditure of time and effort uneconomical. A second important consequence is the economy of time in class-room management.

No. 14. April 3. A. DUNCAN YOCUM. *The Compelling of Efficiency Through Teacher Training.* 469–477. In this article the

author views the teaching process from the standpoint of causation. All the responses that an individual is able to make are responses to some feature of the environment; and if in education, that environment can be properly controlled, the efficiency of the process is secured. The five forms of effective control are: the cumulative impression, which definitely centers the direction of the pupil's mental activity; the vocabulary; varying inter-connection of details; habit and system; and the transfer of training in one field to other fields of experience.

H. B. WILSON. *Minimum Essentials in Elementary School Subjects.* 198–503. Extracts from the report of the Committee on the Economy of Time in Education. The committee believes that the elementary and secondary period of education could be profitably shortened two years. The reasons for this belief, and the lines in which saving could be made are convincingly set forth.

No. 15. April 10. M. R. TRABUE. *Some Results of a Graded Series of Completion Tests.* 537–540. The tests consist of fifty-six mutilated sentences dealing with common experience. Examples of these sentences are given, and the statistics of their application to several thousand children in the public schools of New York and New Jersey are set forth.

No. 16. April 17. BIRD T. BALDWIN. *The Application of the Courtis Tests in Arithmetic to College Students.* 569–576. The author presents by means of graphs and tables of correlation the results of applying the tests of series B to one hundred sixty-four college students. The average result lies near the norm set up by Mr. Courtis for the 10th grade. Language, mathematics, and science students were found to be rapid but not accurate, engineers were less rapid but more accurate, while English, public speaking, economics, and history students rank below the others in both speed and accuracy.

No. 17. April 24. LEONARD P. AYRES. *School Surveys.* 577–581. Traces briefly the source and history of the school survey movement and gives some of the characteristics of good surveys and the reasons why they are becoming more popular.

JAMES FLEMING HOSIC. *The Essentials in Composition and Grammar.* 581–587. Discusses the Hillegas and Ballou composition scales and recent experimental studies on the significance of grammar for work in language. The author believes that the teaching of much that is now stressed in these subjects must be eliminated.

EDWARD K. STRONG, JR. *Teacher Training.* 587–593. Discusses ways and means of making psychology function more effectively in the work of teachers.

No. 18. May 1. ADAM LEROY JONES. *Memoranda from the Records of a few College Freshmen.* 626–630. A study of the

correlation between entrance examination records and records in college work.

CLELIA DUEL MOSHER. *The Schematogram—A New Method of Graphically Recording Posture and Changes in the Contours of the Body.* 642–645. The article gives a description of the apparatus and illustrates its use with diagrams.

No. 19. May 8. JOHN W. WOOD, JR. *The Educational Balance Sheet.* 679–684. The scheme of a balance sheet similar to that drawn up at intervals in large factories is given in detail, and illustrated with applications to concrete situations. It is a very helpful device to enable principals and teachers to judge of the efficiency of their work.

No. 21. May 22. HELEN THOMPSON WOOLLEY. *The Issuing of Working Permits and Its Bearing on Other School Problems.* 726–733. Points out various ways in which the office issuing working permits may contribute to a better adjustment between school training and subsequent careers in business and industries.

J. B. SEARS. *Occupations of Fathers and Occupational Choices of 1039 Boys in Grades Seven and Eight of the Oakland Schools.* 750–756. The study shows that the fathers of the boys follow sixty different occupations, and that the choices of the sons include fifty-six occupations. Many of the latter are different from the former so that eighty different callings are represented. Only seven and three-tenths percent of the boys preferred their fathers' callings.

No. 22. May 29. LOUIS W. RAPEER. *College Pedagogy,* 777–781. A list of thirty-three points indicated as qualities of a good college instructor by college seniors and juniors.

No. 25. June 19. HARRIS HANCOCK. *What Course of Study Should be Taken by a Boy Who Is Entering High School?* 893–900. A tabulation of answers submitted by prominent business men, theologians, lawyers, and physicians to the question, "What course would you advise a boy to take on entering the high school?" The professional men in a great majority of cases advocate a course requiring both classics and mathematics. A larger number of business men would make classics optional and some would also include mathematics among the options.

PUBLICATIONS RECEIVED

ALDA GRACE BARBER. *The Localization of Sound in the White Rat.* Reprinted from The Journal of Animal Behavior, July-August, 1915, vol. 5, no. 4, pp. 292–311.

The author finds that the white rat is able to localize a noise with an average accuracy of from two to four inches. The association between such an accuracy of localization and food is established in from 40 to 136 trials. The animals showed no ability to localize tones from tuning forks, or clangs from an organ pipe. Indeed, tones were absolutely ignored. The localizing association was retained practically unimpaired for forty days.

FREDERICK BETZ. *Vom grossen Koenig und anderen.* Cincinnati: The American Book Company, 1915. Pp. 216.

A collection of interesting and easy anecdotes from German history. Intended for beginners in German. There are many illustrations.

FRANK W. BLACKMAR AND JOHN LEWIS GILLIN. *Outlines of Sociology.* New York: The Macmillan Company, 1915. Pp. viii, 586. $2.00.

This book is intended as a textbook for college and university classes and as a comprehensive survey of the field for the general reader. Part One defines and indicates the scope of sociology and the purpose and methods of the study. Part Two treats of social evolution and deals with such topics as the origins of society, social organizations, the family, the state, the production and consumption of wealth, and the rise of ethics and religion. Part Three discusses socialization and social control with particular attention to the psychological factors that are active in social groups. Part Four outlines the various types of social control in relation to the development of social ideals, such as ideals of government, control by force, the enlightenment resulting from education, and the ideal of justice. Part Five enumerates the more important forms of social pathology, as poverty, crime, and social degeneration, and reviews modern attempts at treating social diseases. Part Six develops the field and methods of social investigation, and Part Seven presents a sketch of the history of sociology. It is an ably conceived and carefully wrought-out book, and presents many topics of interest to the psychologist and educator.

MEYER BLOOMFIELD. *Readings in Vocational Guidance.* Boston: Ginn and Company, 1915. Pp. xv, 723.

School administrators are realizing as never before that it is the function of education to prepare for life, and that both the public and the pupils have a right to demand that education should be so adjusted as to fit the boy or girl for the kind of work for which he is best adapted. Hence, there is a rapidly growing interest in the subject of vocational guidance. The literature of the subject, however, is widely scattered in reports and periodicals that are not accessible to the ordinary student. The author has, therefore, rendered a signal service in bringing together in this volume the most important contributions to the subject. In Part One the viewpoint of vocational guidance is developed, and the relation of such work to the ordinary routine of the school is discussed. Part Two treats of the foundations of vocational guidance, giving a large number of illustrative examples of efforts to direct pupils in their choice of vocations in different cities. Part Three presents examples of vocational information, giving the status and possibilities of advancement for the architect, the grocer, the machinist, the telephone operator, the building trades worker, the bookbinder, and other occupations open to boys and girls. Finally, in Part Four some practical aspects of vocational guidance are considered. The book contains an abundance of valuable information on the subject.

GEORGE M. BRACE AND D. D. MAYNE. *Farm Shop Work.* Cincinnati: The American Book Company, 1915. Pp. xii, 291.

An excellent practical manual in wood-working, black-smithing, cement and concrete work, and harness making. It should be found in every rural school.

SAMUEL PAUL CAPEN. *Accredited Secondary Schools in the United States.* Bulletin Number 631, Washington: Bureau of Education, 1915. Pp. 106.

There is a brief discussion of what constitutes an accredited school, a definition of "unit," and a discussion of methods of accrediting. The remainder of the bulletin is devoted to the lists of accredited schools arranged by states.

SAMUEL PAUL CAPEN. *Opportunities for Foreign Students at Colleges and Universities in the United States.* Bulletin Number 654. Washington: Bureau of Education, 1915. Pp. 213.

The bulletin presents a brief historical sketch of the evolution of higher education in the United States, discusses the organization of the leading schools and colleges found in the typical university, com-

pares American with foreign institutions, presents an account of living conditions, the activities of college life, higher educational centers, college entrance requirements, typical curricula, degrees conferred by various institutions, and the organization and offerings of sixty-two institutions of higher learning. While intended for foreign students, the information presented is of distinct interest to American students also.

ED. CLAPARÈDE. *Les types psychologiques et l'interprétation des données statistiques.* Extrait de l'Intermédiaire des Éducateurs, Nos. 24–26, 1915, pp. 33–43.

Professor Claparède calls attention to the fact that the drawing of conclusions as to the mental "type" to which an individual belongs from his response to a mental test, as, for example, in Binet's description-of-an-object test, is always subject to uncertainty in that the test may have revealed merely one of a number of different responses possible to the same individual. He then goes on, in a rather ingenious way, to transfer the problem to the throwing of dice and thus at the same time to show how the reliability of any such conclusions as to "types" can be determined by the application of the statistics of probability.

BERTHA M. CLARK. *An Introduction to Science.* Cincinnati: American Book Company, 1915. Pp. 494.

"The aim of this book is to start young high school pupils on scientific projects which will influence for good their present lives and which under different guise will equally influence for good their future lives." Among the topics treated in the forty-four chapters of the book are the following: heat, food, fuels, clothing, household chemicals, metals, drugs and patent medicines, modern electrical devices, light and photography, sound, machines, pumps and water systems, air and climate, rocks, plants, and animals and their relation to man. The book is profusely illustrated.

ELLWOOD P. CUBBERLEY. *Report of a Survey of the Organization, Scope, and Finance of the Public School System of Oakland, California.* 1915. Pp. 48. 10 cents.

The three parts of this survey deal with the form of organization, the scope and needs of the Oakland school system, and the financial phase of the school problem.

HENRY S. CURTIS. *The Practical Conduct of Play.* New York: The Macmillan Company, 1915. Pp. xi, 330. $2.00.

"This volume is intended as a textbook for those who are preparing themselves for playground positions, and as a practical manual

for all who have to do with the organization of play, whether as parents, as teachers, as play ground directors, or as supervisors. To this end the aim has everywhere been to give definite detailed information and suggestions, such as can be easily followed and will be helpful in the daily work of the director." The author treats the construction of play grounds, their equipment, the swimming pool, the organizing of play, the training of play directors, the play ground attendants, the curriculum of play, the play festival, and play ground discipline. It is a valuable book for teachers, principals, and supervisors of the play activities of children.

JOHN DEWEY AND EVELYN DEWEY. *Schools of Tomorrow.* New York: E. P. Dutton and Company, 1915. Pp. 316. $1.50 net.

A very interesting and useful account of present tendencies in education, and of schools that exemplify these tendencies. The philosophical background of the book is derived largely from the teachings of Rousseau. Among the special schools described are those of Mrs. Johnson at Fairhope, Alabama, the elementary school of the University of Missouri, directed by Prof. J. L. Meriam, Public School 45 of the Indianapolis School System, the Francis Parker School, Chicago, the Phoebe Thorn Experimental School of Bryn Mawr College, the School of Interlaken, Indiana, the Little School in the Woods, at Greenwich, Conn., Miss Pratt's Play School, New York City, the Teachers College Kindergarten, and the Gary System in Indiana. There is an appreciative account of the Montessori idea, and a discussion of the fundamental principles which underly all of these attempts to break away from the traditional organization of the schools.

JEANNETTE EATON AND BERTHA M. STEVENS. *Commercial Work and Training for Girls.* New York: The Macmillan Company. 1915. Pp. xviii, 289. $1.50.

The material for this book was collected and put into form under the auspices of the Co-operative Employment Bureau for Girls, Cleveland. The topics dealt with include public and private commercial schools, night commercial schools, the efforts of commercial schools to draw pupils from public schools, vocational guidance, and a summary of recommendations for legislation. In Part Two there is a classification of office work based on the study of 2618 office positions, a discussion of the development of work for women, the conditions of office work, and the just demands of the employer. The data have the value of having been collected from actual concrete business conditions.

Feeble Minded in Ontario. Ninth Report. Toronto, 1915. 29 pp.

This is Dr. MacMurchy's report for the year ending October 31, 1914. It covers a variety of aspects of the general problem of the feeble-minded. The two most important events in the year were the passing by the Ontario legislature of an Act empowering the establishment of special classes for mental defectives and the opening at the Toronto General Hospital of a special clinic for the private examination of mentally defective children and adults.

Francis W. Parker School Year Book. Education through Concrete Experience. Chicago: Francis W. Parker School, 1915. Pp. 186. 35c.

Interesting chapters are: Mental Imagery in Geography, The School Museum, the Pupil's Experience as the Source of his Problems in Arithmetic, Experience Building in the Teaching of Geometry, and the Value of Games in the Teaching of Modern Languages.

SHEPHERD IVORY FRANZ. *On the Functions of the Cerebrum. I. Symptomatological Differences Associated with Similar Cerebral Lesions in the Insane. II. Variations in Distribution of the Motor Senses.* The Psychological Monographs, Vol. xix, no. 1, April 1915. Whole No. 81. Pp. 162. $1.50.

The extreme localization of function in the cerebral cortex which is set forth by many writers in psychology receives a severe blow from the studies reported in this monograph. Whether we deal with the cerebral lesions of insane patients or with experiments on lower animals, the conclusion is forced home that the same forms of behavior are not always due to the activities of the same cerebral cells. The explanations of changes in mental life offered by the neural psychologists have been much too highly simplified and schematized. The actual neurological connections appear to be extremely complex, and the nervous interrelations are such that after a short time one portion of the cortex may perform most of the functions of other more or less distant areas.

ELEANOR A. MCGAMBLE. *A Defence of Psychology as a Science of Selves.* Reprinted from the Psychological Bulletin, Vol. 12, No. 5, May 1915. Pp. 194–201.

This is a reply to Miss Josephine Curtis' attack on Miss Calkins' conception of psychology.

EDWIN GREENLAW. *Familiar Letters, English and American.* Chicago: Scott, Foresman and Company, 1915. Pp. 309. 40c.

Among the well known writers from whose correspondence selections are made are Thomas Grey, Benjamin Franklin, William Cow-

per, George Washington, Charles Lamb, Washington Irving, Jane Welch Carlyle, Charles Dickens, Abraham Lincoln, R. L. Stevenson, and T. H. Huxley.

THOMAS H. HAINES. *The Ohio Plan for the Study of Delinquency.* Reprinted from Popular Science Monthly, June 1915, 576–580.

An account of the new Ohio law establishing a bureau of juvenile research under the auspices of which delinquent children are to be studied from the standpoint of biology, psychology, and sociology. Doubtful cases of defective delinquents will be given experimental treatment in special schools, while the non-defective delinquents will be saved from institutionalization.

THOMAS H. HAINES. *Point Scale Ratings of Delinquent Boys and Girls.* Reprinted from the Psychological Review, Vol. 22, No. 2, March 1915, 104–109.

Two hundred delinquents in Ohio industrial schools were examined both by the Binet method and the Yerkes point scale method. There is a very considerable difference between the two ratings, particularly above ten years. The point scale ratings are from two to four years higher than those obtained by the Binet scale. The author thinks that the point scale ratings are the more reliable.

WILLIAM HEALY AND MARY TENNEY HEALY. *Pathological Lying, Accusation, and Swindling.* Boston: Little, Brown and Company, 1915. Pp. xi, 286. $2.50 net.

This book is Number One of the Criminal Science Monographs—a supplementary series to the Journal of the American Institute of Criminal Law and Criminology. The authors give a resume of previous studies, especially from German and French sources, and give a detailed account of twelve cases of pathological lying and swindling, nine cases of pathological accusation, and six cases of border-line mental types. In view of the frequency with which such cases of lying are brought to the attention of the teacher, and of the importance of knowing how to deal with them skillfully and effectively, the book should be widely read by educators. It is perhaps the first time that the "Aussage test" developed by Stern has been used as a means of routine diagnosis of mental defects. The material here brought together is of the greatest value to the educator for the light that it throws upon a particularly troublesome type of school offenders.

ETHEL HUESTON. *Prudence of the Parsonage.* Indianapolis: The Bobbs-Merrill Company, 1915. Pp. 347. $1.25.

A pretty love story depicting the life of the Methodist minister in a small village of the middle west. The romantic heroine seems a bit

stupid and obstinate however in her refusal to do the obvious thing, and accept the happiness fate thrust upon her.

WALTER S. HUNTER. *The Auditory Sensitivity of the White Rat.* Reprinted from the Journal of Animal Behavior, Vol. 5, No. 4, July-August 1915, 313–329.

There is a practical insensitivity to many pitches in the lower region of the scale for the white rat. This apparently goes along with a sensitivity to noises of the same predominant pitch. Apparent reactions to tone are most probably made to accompanying noises.

JOSEPH KENNEDY. *Fundamentals in Methods in Elementary Schools.* New York: The Macmillan Company, 1915. Pp. xxiv, 321. $1.40.

"The purpose of this book is not to serve as a consecutive and detailed methodology, but as a discussion, as concretely illustrated as possible, which will, it is hoped, awaken or arouse elementary teachers to a realization of many common-sense injunctions or warnings which need only be mentioned, to be obeyed or avoided. It is intended to discuss many of the chief points or turns of procedure, and of methods in the large; to point out fields and directions to be sought and followed or to be shunned and avoided." The titles of the chapters are The Teacher and Methods, Clear Picturing, the Most Prevalent Mistakes (Telling vs. Teaching), the Recitation Period, Reading, Woodwork, Writing, Language Work, Arithmetic (elementary), Arithmetic (advanced), Geography, History, Hygiene, the Teaching of Morals, the Special Subjects, and Methods in School Management. The book presents a very attractive appearance, and bridges the yawning gap between pure theory and practical applications.

SAMUEL C. KOHS. *A New Departure in the Treatment of Inmates of Penal Institutions.* Publications of the Research Department, Chicago House of Correction. Bulletin No. 1. July, 1915. 14 pp.

A brief account of the attempts that are being made in this department to make an individual study of the conditions that have led to the commission of anti-social acts on the part of offenders sent to the House of Correction. The present plan consists largely of an extended interview with questioning and a series of mental tests on the basis of which the institutional treatment is adjusted. The pamphlet also sketches plans that are in mind for future developments in this work, with special reference to diagnosing the mental status of those committed to the institution.

HELEN MACMURCHY, M. D. *Organization and Management of Auxiliary Classes.* Department of Education, Ontario. Educational Pamphlets, No. 7. 1915. 212 pp.

This paper-covered pamphlet is really a book, and a very excellent one, upon the problem of special classes for the mentally and the physically defective. Its eight chapters have primarily in view the situation in Ontario, but the treatment is by no means restricted and official in tone. The chapters deal with the need for such classes, sketch the history of the movement for special classes in Europe and America, discuss the qualification and training of teachers, describe the equipment of the classroom, outline a course of study and indicate the probable cost. In the several appendixes will be found advice to parents of defective children, an extended account of the work done in Philadelphia Special Classes and an excellent bibliography. There are a considerable number of diagrams and photographic illustrations and a good index. We commend this pamphlet to those dealing with special class education.

The Measurement of Efficiency of Schools Established for the Deaf—Age, Grade and Progress Norms, Mentality Tests, etc. Indianapolis: State School for the Deaf, 1914. Pp. 24.

Among points considered by the committee were the mental, physical, and moral conditions of the pupils, the arrangement of the curriculum, the quality of the teaching force, progress of pupils, supervision, independence and self-containment of the pupils, equipment and environment of the school, and results as demonstrated in the after life of pupils. The following are put down as the most important criteria of success: teaching power, including the training of the pupils in how to study, preparation of the lesson, and skill in prepresentation, government and personality. The pamphlet also discusses eugenics and euthenics, tests and standards of efficiency, the Binet-Simon scale, and gives a brief bibliography of good books and articles on the subject.

BENJAMIN W. MITCHELL. *The Writing of Narrative Latin.* Cincinnati: American Book Company, 1915. Pp. 226.

From the selections and exercises given it is hard to see much difference between this so-called narrative Latin and the old fashioned prose composition where isolated sentences are changed into Latin.

WILLIAM C. MOREY. *Ancient Peoples.* Cincinnati: American Book Company, 1915. Pp. vi, 634.

A study of the history of mankind from the earliest oriental civilization through the Greeks and the Romans to the rise of the Germans in the west, and the crushing of the Empire by the Ottomans in the East. The book is well gotten up and admirably illustrated.

JOHN LOVETT MORSE AND FRITZ B. TALBOT. *Diseases of Nutrition and Infant Feeding.* New York: The Macmillan Company, 1915. Pp. ix, 346. $2.50.

"This book was written to meet what seemed to the authors two distinct needs in American pediatric literature. A detailed description of the scientific basis of rational infant feeding and a description of the methods of infant feeding taught in the Harvard Medical School." The topics of the book are Physiology and Metabolism, Breast Feeding, Artificial Feeding, Diseases of the Gastro-Intestinal Canal, and Diseases of Nutrition. There are profuse citations to original contributions on the subject, and one is left with the impression that here is a genuinely scientific work, and not the ordinary doctor's book for mothers. At the same time the style is not unnecessarily complicated and the argument can be read and comprehended by any intelligent, educated person.

SHILO SHAFFER MYERS. *School Music Reader.* Cincinnati: American Book Company, 1915. Pp. 175.

The author presents this as a complete course in vocal music for rural and village schools and graded schools in which music has not previously been taught. Attention is directed to rhythmic exercises and to ear training. The selections for part singing are chiefly old and familiar popular melodies.

LOUISE ELLISON ORDAHL AND GEORGE ORDAHL. *Qualitative Differences Between Levels of Intelligence in Feeble-Minded Children.* Journal of Psycho-Asthenics Monograph Supplements, Vol. 1, No. 2, June 1915. Pp. 50.

Ten cases were selected from each of three groups of children whose mental ages were six, eight, and ten as determined by the Binet-Simon Scale. Each of these groups was given fifteen tests as follows: dynamometer, judgment of movement, simple reaction to sound, tapping tests, attention span, discrimination of grays, judgment of forms (two dimensions), judgment of form (number two), judgment of size, judgment of form (three dimensions), memory for geometrical forms, modified typewriting, ink-blot test, drawing of designs inverted, and comprehension of complex directions. The results for each of these tests are given separately and norms for each of the different mental ages are drawn up. There was a noticeable lack of energy and capacity for voluntary effort on the part of the feeble-minded. All are weak in degree, duration, and span of attention. The monograph is an interesting and valuable piece of work.

RUDOLF PINTNER. *The Standardization of Knox's Cube Test.* Reprinted from the Psychological Review, Vol. 22, No. 5, Sept. 1915, 377–401.

The author believes that the Knox Cube Test is a valuable aid to the diagnosis of the degree of mental defect. The test has been given to 867 normal children and 463 feeble-minded. The author finds it impossible to lay down any definite percentages for the standardization of the test. The curves of feeble-minded children follow those of the normal children closely, generally remaining a little below. The author thinks that we have been too ready to avoid hard work and that, therefore, present attempts at the solution of the problems of standardization are inadequate. Only by a thoroughgoing treatment of each and every test will we ever arrive at tests that will give us something more than a mere approximation to a child's mental age.

Report of the Commissioner of Education for the Year Ended June 30, 1914. Bulletin No. 645. Washington: Bureau of Education, 1915. Two volumes. Pp. xxxviii, 810, xxv, 565.

The present report of the Commissioner of Education maintains the high standard expected of this "year-book of American education," and contains several new features which add materially to its excellence. Of especial interest to educational psychologists are Dr. Strayer's discussion of the "Adaptation of Schools to the Varying Capacities and Needs of the School Population," Superintendent Van Sickle's account of "School Surveys and School Supervision in Larger Cities," a new section on "School Progress in Smaller Cities," Mr. William T. Bawden's presentation of "Progress in Vocational Education," Miss Almira M. Winchester's chapter on "Kindergarten Progress," Miss Anne E. George's account of "The Montessori Movement in America," and a chapter on "School Surveys" by Edward B. Buchner, giving an epitome of all the important surveys to date.

Second Annual Conference on Educational Measurements held under the Auspices of the Extension Division of Indiana University, April 16 and 17, 1915. Indiana University Bulletin, Vol. 13, No. 11, October, 1915. Pp. 221. Fifty cents.

At this conference the speakers from abroad were S. A. Courtis, director of the department of educational research, Detroit, Mich., and Leonard P. Ayres, director of the division of education, Russell Sage Foundation. Mr. Courtis gave addresses on Supervisory Control by Means of Objective Standards, Limitation of Training, and Educational Diagnosis; Dr. Ayres spoke on Making Education Definite, The Measurement of Educational Processes and Products,

and A Survey of School Surveys. Other important addresses were those by M. E. Haggerty on Co-operative Research from the Viewpoint of the University, and by Earl Hudelson on Standards and Measurements in English Composition. The latter paper discussed the application of the Ballou Scales in English composition to 386 pupils of the seventh, eighth, and ninth grades. The ratings with and without the scales showed little difference in results.

ANNA TOLMAN SMITH. *Secondary Schools in the States of Central America, South America, and the West Indies: Scholastic Scope and Standards.* Bulletin No. 653. Washington: Bureau of Education, 1915. Pp. 40.

The monograph gives some idea of the reconstruction of educational ideals that is taking place in the states of Central and South America under the pressure of economic and industrial developments.

Special Report of the Boise Public Schools. Boise, Idaho; 1915. Pp. 96.

This report is in the nature of a valedictory from Superintendent Meek, who after seven years of service leaves Boise to take charge of the schools of San Antonio. Interesting features of the report are a study in retardation and acceleration, an investigation of English usage and the mechanism of English, results of the use of the Courtis Standard Tests in Arithmetic, Series A, industrial education, and the co-operation of the community with the public schools.

Statistics of Certain Manual Training, Agricultural, and Industrial Schools, 1913–1914. Bulletin No. 644. Washington: Bureau of Education, 1915. Pp. 79.

Represents a praiseworthy effort to secure reliable information on what is actually being done in industrial education in different parts of the country.

JOHN LINCK ULRICH. *Distribution of Effort in Learning in the White Rat.* Behavior Monographs, Vol. 2, No. 5, 1915. New York: Henry Holt & Co., 1915. Pp. 51.

The essential problem here is to discover the most economical method for rats to learn to get out of the latch box, the maze, or the inclined plane box—one trial, three trials, or five trials per day. In conformity with the results of experiments in human learning, distribution of repetitions is found more economical than bunching them, *i. e.*, one trial per day is more economical than three or five. Indeed, one series of tests showed one trial every third day to be the most economical. The same principle holds whether each problem is learned singly or the three problems are learned abreast.

CHARLES W. WADDLE AND WILLIAM T. ROOT, JR. *A Syllabus and Bibliography of Child Study, with Special Reference to Applied Child Psychology.* Bulletin of the Los Angeles State Normal School, August, 1915. Pp. 98.

An excellent outline of the somewhat inchoate mass of material referred to under the name of child study. The titles of the six sections are Introductory and Historical, Physical Growth and Hygiene, Biological Perspective and Instincts, Activities with an Instinctive Basis, Child Psychology, and Types Varying from the Normal-Mental Tests. The outline of each topic is followed by a carefully selected working bibliography. The syllabus represents the most successful attempt yet made to organize this material, and it is hoped that the authors will immediately expand it into a systematic textbook.

E. J. WARD. *The Schoolhouse as the Polling Place.* Bulletin No. 638, Washington: Bureau of Education, 1915. Pp. 25.

Arguments for and examples of the successful use of the schoolhouse as a polling place. It fosters the civic spirit of the community, and trains the school children in the highest activity of citizenship.

HENRY T. WEED. *Chemistry in the Home.* Cincinnati: The American Book Company, 1915. Pp. 385.

This admirable little manual will introduce young people to the simpler and more familiar aspects of chemistry, and will arouse a desire to know more about the subject. While intended for pupils who elect chemistry early in their high school course, it might be used to advantage in the upper elementary grades.